

Chapter 4: Nutrient Source Control Programs

Edited by Carlos Adoriso and Randall McCafferty

SUMMARY

Source control program requirements are established by legislation for the Southern and Northern Everglades areas depicted in **Figure 4-1**. The Everglades Forever Act (EFA) [Section 373.4592, Florida Statutes (F.S.)] established regulatory source control requirements for the Everglades Construction Project (ECP) basins and the non-Everglades Construction Project (non-ECP) basins in the Southern Everglades with primary responsibility assigned to the South Florida Water Management District (District or SFWMD). The regulatory program has a long-standing success record based on quantitative phosphorus load limitations. The Northern Everglades and Estuaries Protection Program (NEEPP) (Section 373.4595, F.S.) refers to existing voluntary and regulatory source control approaches for the Lake Okeechobee, Caloosahatchee River and Estuary, and St. Lucie River and Estuary watersheds (the Northern Everglades), with varying responsibilities accorded to the District, Florida Department of Agriculture and Consumer Services (FDACS), and Florida Department of Environmental Protection (FDEP) as detailed in a Memorandum of Understanding (MOU) among the agencies. Accordingly, the agencies implement their respective programs through specific rules promulgated by each agency based on statutory authorizations and the MOU. The roles under the existing MOU are currently being reconsidered in light of FDEP's overarching authority in Northern Everglades restoration through the development and implementation of Basin Management Action Plans (BMAPs) to achieve pollutant load reductions identified in adopted Total Maximum Daily Loads (TMDL).

This chapter and related appendices (Appendices 4-1 through 4-3 of this volume) provide the Water Year 2014 (WY2014) (May 1, 2013–April 30, 2014) update on the District regulatory source control programs mandated by the EFA and NEEPP. These programs address the control of pollutant levels through on-site activities that prevent or reduce pollution at its source, such as agricultural and urban Best Management Practices (BMPs) and regulations. Source control programs along with regional construction projects are generally needed to achieve mandated water quality standards, TMDLs, and Water Quality Based Effluent Limits (WQBEL). Construction projects and other source control programs are described in the Northern Everglades protection plans (see Chapters 8 and 10 of this volume) and permit-specific reports are provided in Volume III. A successful source control program includes comprehensive and cost-effective BMP plans, deadlines for implementation, verification of implementation, water quality monitoring, performance evaluation, and research and demonstration projects. Comprehensive BMP plans include on-site nutrient management practices and minimize off-site nutrient transport through water management and sediment controls.

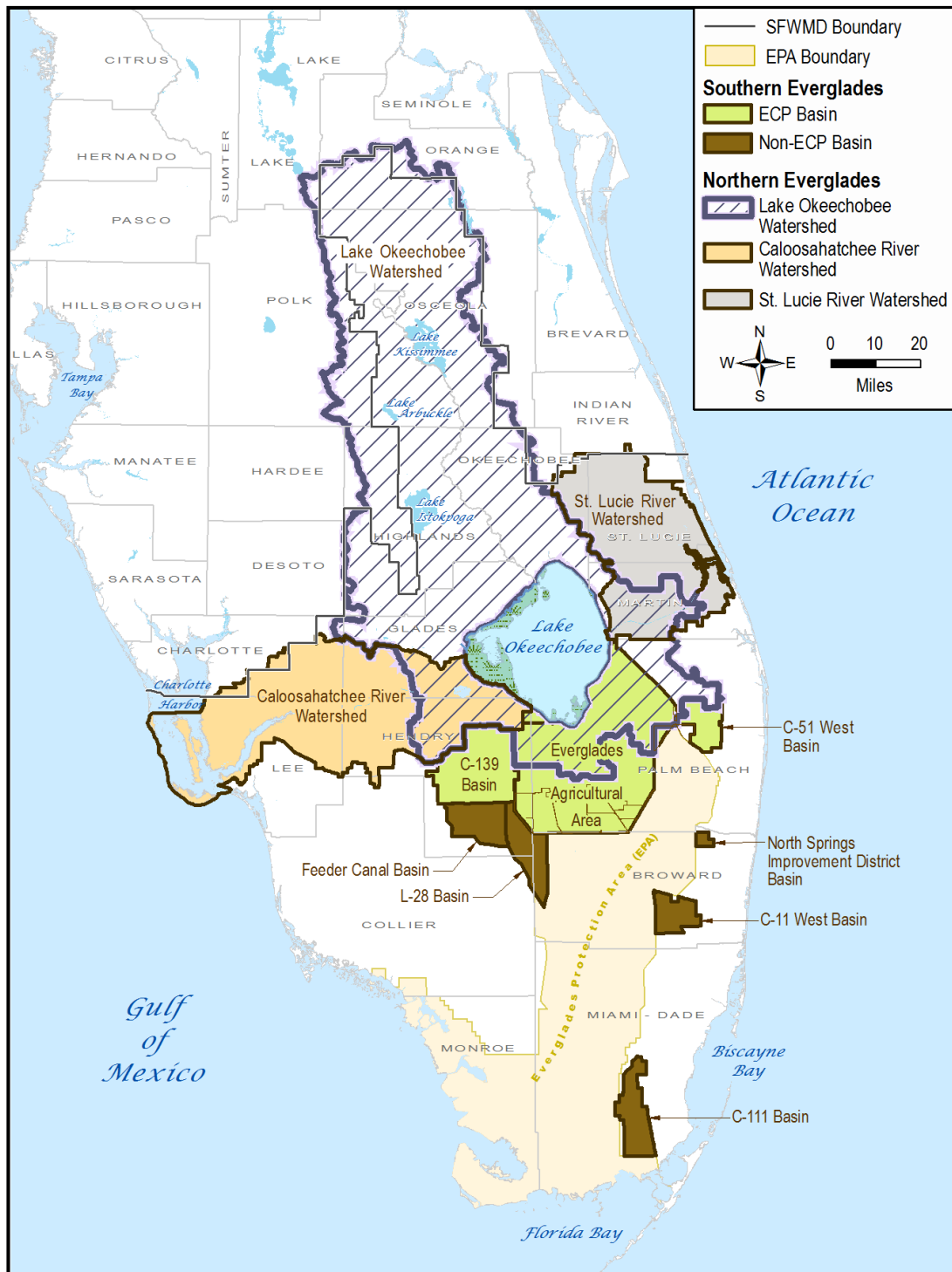


Figure 4-1. The Southern Everglades and Northern Everglades source control program implementation areas.

[Notes: Watershed areas overlap and are based on most recent hydrologic boundaries and may differ from areas shown in previous reports. ECP – Everglades Construction Project; EPA – Everglades Protection Area; Non-ECP – Non-Everglades Construction Project; and SFWMD – South Florida Water Management District.]

Source control is an integral component of Southern and Northern Everglades restoration and protection programs. For the Southern Everglades, source control programs were mandated by the original EFA with follow up planning and supplemental activities incorporated into the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area (Long-Term Plan) (Burns and McDonnell, 2003), and its amendments, and the Restoration Strategies Regional Water Quality Plan (SFWMD, 2012). For the Northern Everglades, source control program planning is incorporated into the Lake Okeechobee Watershed Protection Plan (LOWPP; Chapter 8 of this volume), and the Caloosahatchee and St. Lucie River watershed protection plans (CRWPP and SLRWPP; Chapter 10 of this volume). FDEP has developed, or is developing BMAPs, for the Lake Okeechobee, St. Lucie River and Caloosahatchee River watersheds, and these BMAPs rely on the protection plans developed under the NEEPP.

WATER YEAR 2014 NUTRIENT SOURCE CONTROL HIGHLIGHTS

An overview of nutrient source control program activities during WY2014 is presented below. A summary of the WY2014 total phosphorus (TP) and, where applicable, total nitrogen (TN) in discharge by basin is provided in **Tables 4-1** and **4-2**, respectively.

Everglades Agricultural Area Basin

- Everglades Agricultural Area (EAA) Basin-Level Water Quality Compliance: The EAA surpassed the required 25 percent reduction basin level performance requirement by achieving a 63 percent TP load reduction for WY2014 as compared with the rainfall adjusted pre-BMP baseline predicted load. This equates to a 180 metric ton (mt) reduction due to BMP implementation for WY2014. The total cumulative reduction in TP load runoff from the EAA since WY1996 is 2,853 mt, which represents a long-term reduction of 55 percent.
- Permit-Level Compliance: Report submittals and field inspections served to verify implementation of the permitted BMP plans. BMP inspections were prioritized based on permit level data, the date of previous inspection, and potential impacts due to farm location. Additionally, the permit-level data collected as required under the approved water quality discharge monitoring plans for WY2014 were evaluated to track relative trends within the permits.
- Training, Research and Demonstration:
 - EAAEPD Master Research Permit - A five-year research project on improving BMP effectiveness through the control of floating aquatic vegetation continued for the fourth year under a permit issued to the EAA Everglades Protection District.
 - West Palm Beach Canal Data Collection - A canal water quality and flow data collection effort continues within the West Palm Beach Canal with the objective of furthering the understanding of phosphorus sources, phosphorus transport mechanisms, and sinks affecting TP loading from the EAA at the sub-basin level. The data collection is expected to continue through October 2015 and followed by analysis of the data.
 - East Beach Water Control District (EBWCD) canal cleaning BMP demonstration and implementation - The District partnered with EBWCD to implement some of the BMP vegetation control concepts supported by University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) research and simultaneously monitor water quality for trends. Project water quality monitoring began May 2013 and cleaning began August 2013.

Table 4-1. Summary of Water Year 2014 (WY2014) (May 1, 2013–April 30, 2014) total phosphorus (TP) runoff¹ by basin to all sources.

| Basin | Watershed ² | Area ³ (acres ⁴) | TP Load (metric tons ⁴) | TP Unit Area Load (pounds per acre ⁴) | TP Concentration (µg/L) ⁴ |
|--|------------------------|--|--|--|--|
| Feeder Canal | Non-ECP | 68,883 | 7 | 0.21 | 76 |
| L-28 | Non-ECP | 71,790 | 6 | 0.19 | 144 |
| North Springs Improvement District to EPA ⁷ | Non-ECP | 7,022 | 0 | NA ⁷ | - |
| C-11 West to EPA ⁷ | Non-ECP | 45,728 | 3 | NA ⁷ | 13 |
| C-111 to EPA ⁷ | Non-ECP | 72,902 | 2 | NA ⁷ | 6 |
| Everglades Agricultural Area ^{5,6} | ECP | 463,030 | 105 | 0.50 | 94 |
| C-139 ⁵ | ECP | 168,450 | 28 | 0.37 | 181 |
| C-51 West to EPA ⁷ | ECP | 51,080 | 9 | NA ⁷ | 178 |
| EAA 298 and 715 Farms Diversion Basins ⁶ | ECP/LOW | 32,081 | 21 | 1.42 | 204 |
| L-8 | ECP/LOW | 106,440 | 4 | 0.09 | 32 |
| Upper Kissimmee | LOW | 1,028,421 | 72 | 0.16 | 77 |
| Lower Kissimmee | LOW | 429,188 | 103 | 0.53 | 153 |
| Taylor Creek/Nubbin Slough | LOW | 196,732 | 108 | 1.21 | 457 |
| Lake Istokpoga | LOW | 394,203 | 30 | 0.17 | 77 |
| Indian Prairie | LOW | 276,577 | 101 | 0.81 | 298 |
| Fisheating Creek/Nicodemus Slough | LOW | 318,042 | 103 | 0.71 | 207 |
| S-4/Industrial Canal | LOW/CRW | 42,146 | 23 | 1.18 | 254 |
| East Caloosahatchee | LOW/CRW | 204,093 | 119 | 1.28 | 267 |
| West Caloosahatchee | CRW | 350,114 | 150 | 0.94 | 65 |
| Tidal Caloosahatchee | CRW | 264,705 | NA ⁸ | NA ⁷ | 60 |
| Coastal Caloosahatchee | CRW | 229,322 | NA ⁸ | NA ⁷ | 58 |
| C-44 | LOW/SLRW | 132,705 | 112 | 1.86 | 319 |
| C-23 | SLRW | 110,874 | 93 | 1.85 | 446 |
| C-24 | SLRW | 83,373 | 56 | 1.48 | 330 |
| C-25 | SLRW | 99,726 | 49 | 1.09 | 203 |
| Ten Mile Creek (TMC) | SLRW | 40,327 | 24 | 1.29 | 226 |
| Other St. Lucie Tributaries Composite ⁹ | SLRW | 61,579 | NA ⁸ | NA ⁷ | 98 |

¹ Data presented in this table may have more than one receiving body and may differ from Chapters 8 and 10 since Chapters 8 and 10 focus solely on loads entering Lake Okeechobee. Cell shading indicates the relative magnitude of each value.

² LOW=Lake Okeechobee Watershed, CRW=Caloosahatchee River Watershed, SLRW=St. Lucie River Watershed, ECP=Everglades Construction Project basins, Non-ECP=Non-Everglades Construction Project basins

³ Sub-watershed acreage is based on most recent hydrologic boundaries and may differ in total acreage from previous reports.

⁴ 1 acre=0.4047 hectares; 1 metric ton=1,000 kg; 1 pound per acre=1.12 kilogram per hectare; µg/L (micrograms per liter)=ppb (parts per billion)

⁵ Discharges from the Everglades Construction Project (ECP) basins receive further treatment downstream through the STAs prior to discharge to the EPA.

⁶ Estimated discharge from a 1,233-acre portion of the East Beach Water Control District represented in EAA Baseline Period data is tabulated both in the Everglades Agricultural Area and the EAA 298 and 715 Farms (a.k.a. Closter Farms) Diversion Basins

⁷ The C-11 West and C-111 loads only represent the loads to the EPA and not their discharges to tide; the C-51 West loads only represent the loads to the STAs and EPA and not their discharges to tide and to the L-8 basin. Because monitoring to compute nutrient load does not represent all runoff from the basin, UAL is not available for these basins.

⁸ NA – not available. No instrumentation is in place for flow and/or water quality monitoring.

⁹ Includes tributaries representing the North Fork (excluding Ten Mile Creek), South Fork, North Mid-Estuary, South Mid-Estuary, Basin 4-5-6, and South Coastal basins

Table 4-2. Summary of WY2014 total nitrogen (TN) runoff¹ by basin to all sources.

| Basin | Watershed ² | Area ³ (acres ⁴) | TN Load (metric tons ⁴) | TN Unit Area Load (pounds per acre ⁴) | TN Concentration (µg/L) ⁴ |
|--|------------------------|--|--|--|--|
| Feeder Canal | Non-ECP | 68,883 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| L-28 | Non-ECP | 71,790 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| North Springs Improvement District to EPA ⁷ | Non-ECP | 7,022 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| C-11 West to EPA ⁷ | Non-ECP | 45,728 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| C-111 to EPA ⁷ | Non-ECP | 72,902 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Everglades Agricultural Area ^{5,6} | ECP | 463,030 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| C-139 ⁵ | ECP | 168,450 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| C-51 West to EPA ⁷ | ECP | 51,080 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| EAA 298 and 715 Farms Diversion Basins ⁶ | ECP/LOW | 32,081 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| L-8 | ECP/LOW | 106,440 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Upper Kissimmee | LOW | 1,028,421 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Lower Kissimmee | LOW | 429,188 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Taylor Creek/Nubbin Slough | LOW | 196,732 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Lake Istokpoga | LOW | 394,203 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Indian Prairie | LOW | 276,577 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| Fisheating Creek/Nicodemus Slough | LOW | 318,042 | NA ¹⁰ | NA ¹⁰ | NA ¹⁰ |
| S-4/Industrial Canal | LOW/CRW | 42,146 | 217 | 11.33 | 2,435 |
| East Caloosahatchee | LOW/CRW | 204,093 | 868 | 9.37 | 1,948 |
| West Caloosahatchee | CRW | 350,114 | 1,463 | 9.21 | 633 |
| Tidal Caloosahatchee | CRW | 264,705 | NA ⁸ | NA ⁸ | 1,163 |
| Coastal Caloosahatchee | CRW | 229,322 | NA ⁸ | NA ⁸ | 1,041 |
| C-44 | LOW/SLRW | 132,705 | 1,247 | 20.72 | 3,542 |
| C-23 | SLRW | 110,874 | 361 | 7.17 | 1,726 |
| C-24 | SLRW | 83,373 | 255 | 6.75 | 1,503 |
| C-25 | SLRW | 99,726 | 350 | 7.74 | 1,449 |
| Ten Mile Creek (TMC) | SLRW | 40,327 | 102 | 5.58 | 981 |
| Other St. Lucie Tributaries Composite ⁹ | SLRW | 61,579 | NA ⁸ | NA ⁸ | 903 |

¹ Data presented in this table may have more than one receiving body and may differ from Chapters 8 and 10 since Chapters 8 and 10 focus solely on loads entering Lake Okeechobee. Cell shading indicates the relative magnitude of each value.

² LOW=Lake Okeechobee Watershed, CRW=Caloosahatchee River Watershed, SLRW=St. Lucie River Watershed, ECP=Everglades Construction Project basins, Non-ECP=Non-Everglades Construction Project basins

³ Sub-watershed acreage is based on most recent hydrologic boundaries and may differ in total acreage from previous reports.

⁴ 1 acre=0.4047 hectares; 1 metric ton=1,000 kg; 1 pound per acre=1.12 kilogram per hectare; µg/L (micrograms per liter)=ppb (parts per billion)

⁵ Discharges from the Everglades Construction Project (ECP) basins receive further treatment downstream through the STAs prior to discharge to the EPA.

⁶ Estimated discharge from a 1,233-acre portion of the East Beach Water Control District represented in EAA Baseline Period data is tabulated both in the Everglades Agricultural Area and the EAA 298 and 715 Farms (a.k.a. Closter Farms) Diversion Basins

⁷ The C-11 West and C-111 loads only represent the loads to the EPA and not their discharges to tide; the C-51 West loads only represent the loads to the STAs and EPA and not their discharges to tide and to the L-8 basin. Because monitoring to compute nutrient load does not represent all runoff from the basin, UAL is not available for these basins.

⁸ NA – not available. No instrumentation is in place for flow and/or water quality monitoring.

⁹ Includes tributaries representing the North Fork (excluding Ten Mile Creek), South Fork, North Mid-Estuary, South Mid-Estuary, Basin 4-5-6, and South Coastal basins

¹⁰ NA - Not Applicable, Reporting on this parameter is currently not a statutory requirement

C-139 Basin

- **C-139 Basin-Level Water Quality Compliance:** The C-139 Basin discharged 28 mt of TP, which is above the rainfall adjusted pre-BMP baseline target load of 17 mt but below the

limit of 41 mt. Noncompliance with the basin performance measure occurs when the target load is exceeded three consecutive years or the limit load is exceeded in a single year. Since this is the first year since WY2012 that the basin was above the target load and the limit was not exceeded, the basin is in compliance with the basin-level performance measure requirement.

- Permit-Level Compliance: Report submittals and field inspections served to verify BMP implementation in WY2014. BMP verifications were conducted for all permitted basins.
- Upstream Water Quality Monitoring and Optimization: TP concentration and flow data were collected from eight monitoring stations installed in the C-139 Basin to represent runoff from the sub-basins. This requirement was established in the November 2010 revisions to Chapter 40E-63, Florida Administrative Code (F.A.C.). The data collected during WY2014 are being reviewed to refine data collection and analysis methods and to identify upstream TP sources and potential water quality improvement projects to control those sources.
- Training, Research and Demonstration:
 - The District provided a BMP training session on May 29, 2014, to the C-139 Basin permittees. This training was provided to assist permittees in satisfying the BMP training requirements of rule 40E-63.435(4), F.A.C., or to supplement their existing training programs.
 - The District maintains an agreement with the UF/IFAS authorizing the use of four District automatic water quality samplers for research purposes within the C-139 Basin. The current research monitors the effects of an aboveground impoundment demonstration project. The agreement requires submittal of the project data and reports.

Non-ECP Basins

- The total TP load of 17.3 mt discharged to the Everglades Protection Area (EPA) from the non-ECP basins during WY2014 represents a continued decreasing trend in TP loads to the EPA since implementation of basin diversions and other water quality improvement projects beginning in WY1998.
- Ongoing District and local projects in support of water quality improvements in discharges to the EPA include public outreach and education, the Seminole Tribe Water Conservation Plan Project in the Big Cypress Seminole Indian Reservation, a Flow Equalization Basin and restoration plan in the C-139 Annex, and the Hillsboro Site 1 Impoundment.
- Mandatory implementation of BMPs and water quality requirements through Environmental Resource Permit (ERP) conditions continues in the North Springs Improvement District Basin and certain areas within the Feeder Canal Basin. In the North Feeder Canal Sub-basin, the District continues to work with landowners to achieve a 50 micrograms per liter ($\mu\text{g/L}$) phosphorus concentration in discharges as described in the Long-term Plan. The WY2014 TP flow-weighted mean concentration (FWMC) in discharges from the North Feeder Canal Sub-basin was 195 $\mu\text{g/L}$. The Long-Term Plan relies on initiation of rulemaking for implementation of a mandatory source control program in the Feeder Canal Basin should the TP concentration in discharges not achieve a 50 $\mu\text{g/L}$ level. The WY2014 TP FWMC for the entire Feeder Canal Basin was 76 $\mu\text{g/L}$. Therefore, implementation of a regulatory source control program in the Feeder Canal Basin is still under consideration.

Lake Okeechobee, Caloosahatchee River and St. Lucie River Watersheds

- The District developed preliminary supporting information for amendments to the Works of the District (WOD) Program authorized under Chapter 40E-61, F.A.C. The 1989 WOD rule protects District works by issuing a permit for a mandatory BMP plan that controls nutrients in discharges from all existing and proposed land uses, providing "reasonable assurance" permitting criteria, and requiring deadlines for BMP implementation in portions of the Lake Okeechobee Watershed. The District intends to propose amendments to establish this program in the expanded watershed boundaries encompassing the entire Northern Everglades watersheds and will update the permitting criteria to allow the District to ensure that water quality in stormwater runoff to WOD are compatible with the District's ability to implement statutory mandates. These amendments will be compatible with FDACS' voluntary agricultural BMP program and FDEP's approach to evaluate collective source control program performance under the BMAPs. The District anticipates adoption of WOD rule amendments in 2015 after initiation of the rule development process.
- The District is developing a program to improve BMP efficiencies on District-owned lands leased for agricultural uses. Implementation of specific BMPs on District-owned lands is required by the terms of the lease consistent with the intended use of the land. Prospective properties under consideration in the Lake Okeechobee, St. Lucie, and Caloosahatchee River watersheds are being evaluated based on multiple factors such as, location, past and present land use, size, and lease expiration date.
- The District implemented and enhanced water quality monitoring networks, as needed to support Chapter 40E-61, F.A.C., and anticipated amendments.
- The District reviewed water quality data, current District BMP permitting information, and enrollment data for FDACS agricultural BMP programs to identify priority areas of water quality concern. The District, FDEP, and FDACS held interagency coordination meetings quarterly to develop action plans for areas of water quality concern.

OVERVIEW OF SOUTHERN EVERGLADES SOURCE CONTROL PROGRAMS

Carlos Adorisio

The Southern Everglades source control programs are a critical component of the water quality improvement strategies in the Everglades restoration program. The source control program includes implementation of phosphorus reduction Best Management Practices (BMPs) through a combination of regulatory, cooperative, and educational programs as well as integration of state, local, and regional water quality projects. The Everglades Forever Act (EFA), Section 373.4592, Florida Statutes (F.S.), outlines the South Florida Water Management District's (District or SFWMD) responsibilities and schedules to implement basin-specific solutions to control phosphorus at the source.

The EFA mandates specific source control activities and performance levels, incorporated in regulations and permits, for controlling phosphorus in stormwater runoff from the Everglades Agricultural Area (EAA) and C-139 basins that discharges to the Everglades Construction Project (ECP) Stormwater Treatment Areas (STAs) prior to discharge to the Everglades Protection Area (EPA). BMP implementation guidelines are outlined in a District regulatory program [Chapter 40E-63, Florida Administrative Code (F.A.C.), available at www.sfwmd.gov/rules] for the EAA and C-139 ECP basins. For other basins that discharge to the EPA [the non-Everglades Construction Project (non-ECP) basins], the Florida Department of Environmental Protection (FDEP) utilizes the EFA long-term compliance permits issued to the District to ensure implementation of water quality improvement plans (WQIPs) so phosphorus levels in discharges are consistent with water quality standards for the EPA. See **Figure 4-1** for general basin and EPA locations. The District is required to report annually on each basin's progress in accordance with the EFA. This chapter and related Volume I and Volume III appendices serve as the reporting mechanisms to fulfill this requirement.

Background and details for source control program implementation in all basins with discharges to the EPA, including requirements for (1) implementing BMP plans, discharge monitoring plans, and WQIPs, (2) research and demonstration projects, (3) data evaluation, (4) compliance methodologies and determinations, and (5) educational and outreach activities, have been extensively reported in previous South Florida Environmental Reports (SFERs). This chapter provides an update on the Water Year 2014 (WY2014) (May 1, 2013–April 30, 2014) status and highlighted activities.

Continued implementation of mandatory BMP programs in the EAA and C-139 basins and WQIPs in non-ECP basins, and achievement of the required levels of performance in total phosphorus (TP) loading from these basins are necessary for the District to achieve the TP criterion in the EPA established in Rule 62-302.540, F.A.C., and fulfill its obligations under the EFA, FDEP Permit Number 06, 502590709, and the federal Everglades Settlement Agreement (Settlement Agreement dated July 26, 1991, Case No. 88-1886-CIV-MORENO, United States District Court for the Southern District of Florida, as modified by the Omnibus Order entered in the case on April 27, 2001). During WY2014, the District continued to implement the source control activities on a basin-specific basis. These source control activities are consistent with the EFA TP control strategies and those supplemental activities outlined in the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area (Long-Term Plan) (Burns and McDonnell, 2003), and its amendments, and the Restoration Strategies Regional Water Quality Plan (SFWMD, 2012). Detailed updates on these activities are provided in the *Status of Source Control in the ECP Basins* and *Status of Source Control in the Non-ECP Basins* sections of this

chapter. Supplemental information for the ECP and non-ECP basins is provided in Appendices 4-2 and 4-3 of this volume, respectively.

STATUS OF SOURCE CONTROL IN THE ECP BASINS

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Cordella Miessau and Randall McCafferty

BACKGROUND

For the EAA and C-139 basins, the EFA mandates a regulatory program to implement BMPs to achieve specified TP loads at a regional level by controlling phosphorus at the source. A monitoring network is maintained to assess program performance and make adjustments when necessary to assure compliance [Paragraph 373.4592(4)(f), F.S.]. The EFA further mandates that Chapter 40E-63, F.A.C., is to outline the specific compliance methodology based on historical data or pre-BMP baseline periods defined in the EFA. Achieving TP load requirements from these tributary basins is critical to the success of the ECP because the STAs were designed based on historical data and an expected range of inflow TP loads. The source control program's mandated implementation of BMPs in the EAA and C-139 basins are the primary regulator of TP loads in discharges from the basins prior to inflow to an STA. Along with the design characteristics of the STAs, performance of an STA in reducing TP concentrations to meet EPA water quality standards is dependent on the level of phosphorous discharged to the STA for treatment.

The EFA mandates an agricultural privilege tax for both the EAA and C-139 basins to be used towards the funding of the ECP. For the EAA, the legislature provided a tax incentive credit against the EAA agricultural privilege tax for any phosphorous load reductions achieved in excess of 25 percent to encourage BMP performance and maximize load reductions. The minimum tax rate for the EAA with incentive credits was \$24.89 per acre for notices mailed out from 1994 through November 2013. For notices mailed out from November 2014 to November 2026 the tax rate will not include incentive credits and will be \$25 per acre. Appendix 4-2 of this volume provides a schedule of gradually decreasing tax rates for notices mailed after November 2026. For the C-139 Basin, the tax rate from 2003 to November 2013 is set at \$4.30 per acre, which will reduce to \$1.80 per acre for tax notices mailed out November 2014 and thereafter. Further details can be found in Appendix 4-2.

The EAA Basin is required to achieve a 25 percent reduction of the TP loads discharged when compared to the pre-BMP baseline period as defined in the EFA. The specific compliance methodology to assess if the 25 percent reduction goal is being met is described in Chapter 40E-63, F.A.C., and outlined in the *Water Year 2014 Phosphorus Results* sub-section of this section.

The District collects data at the outflow locations from the EAA Basin to evaluate the overall effectiveness of the BMPs in achieving and maintaining compliance with the basin-level TP load reduction requirement. If the EAA Basin is determined to be out of compliance, then, in accordance with the rule, the data collected by the individual permittees under an approved discharge monitoring plan are evaluated using a secondary compliance method that assesses individual permittee compliance based on their TP load contributions. For the C-139 Basin to be in compliance, it must also meet phosphorus levels relative to the EFA-defined baseline period

using specific methods defined within Chapter 40E-63, F.A.C. Unlike the EAA, which has a load reduction requirement of 25 percent, the C-139 Basin mandate is to not exceed the historical loads observed during the baseline period.

The EFA states that if the C-139 Basin is out of compliance, actions required from individual permittees are conditioned on the proportional share of the TP load discharged from the basin. The proportional share is based on a secondary compliance determination (specified in Chapter 40E-63, F.A.C.) using upstream monitoring data. Upstream monitoring can be individual permittee collected data representing their discharges or District collected data representing sub-regional areas. However, because permittees in the C-139 Basin have not opted to collect water quality and quantity data to characterize their permit-level discharges, a water quality and quantity monitoring network for upstream sub-regional areas throughout the basin is used by the District to differentiate the relative contribution of the hydrologic sub-basins within the C-139 Basin that will support the secondary compliance methodology, if necessary. The specific procedures for determining EAA and C-139 Basin compliance, basin-level and sub-basin level data collection efforts, and permit-level discharge monitoring results are outlined in Appendix 4-2 of this volume.

Investigation to improve the selection, design criteria, and implementation of BMPs is ongoing and occurs through different mechanisms based on the factors specific to each basin. This section provides a WY2014 update on compliance with TP loading limits and source control strategies for the EAA and C-139 basins and includes WY2014 phosphorus results, monitoring program updates, investigative activities, program accomplishments, ongoing activities, and planned initiatives.

EVERGLADES AGRICULTURAL AREA BASIN UPDATE

During WY2014, the TP loads discharged from the EAA Basin decreased by 63 percent compared to the pre-BMP baseline period load adjusted for hydrologic variability associated with rainfall. This represents the nineteenth consecutive year the EAA Basin was in compliance. Because the EAA Basin has been in compliance each year since the program's inception, application of the secondary compliance method at the permit level has not been necessary. Representative monitoring locations for determining WY2014 compliance with the TP load reduction requirement are shown in **Figure 4-2a**.

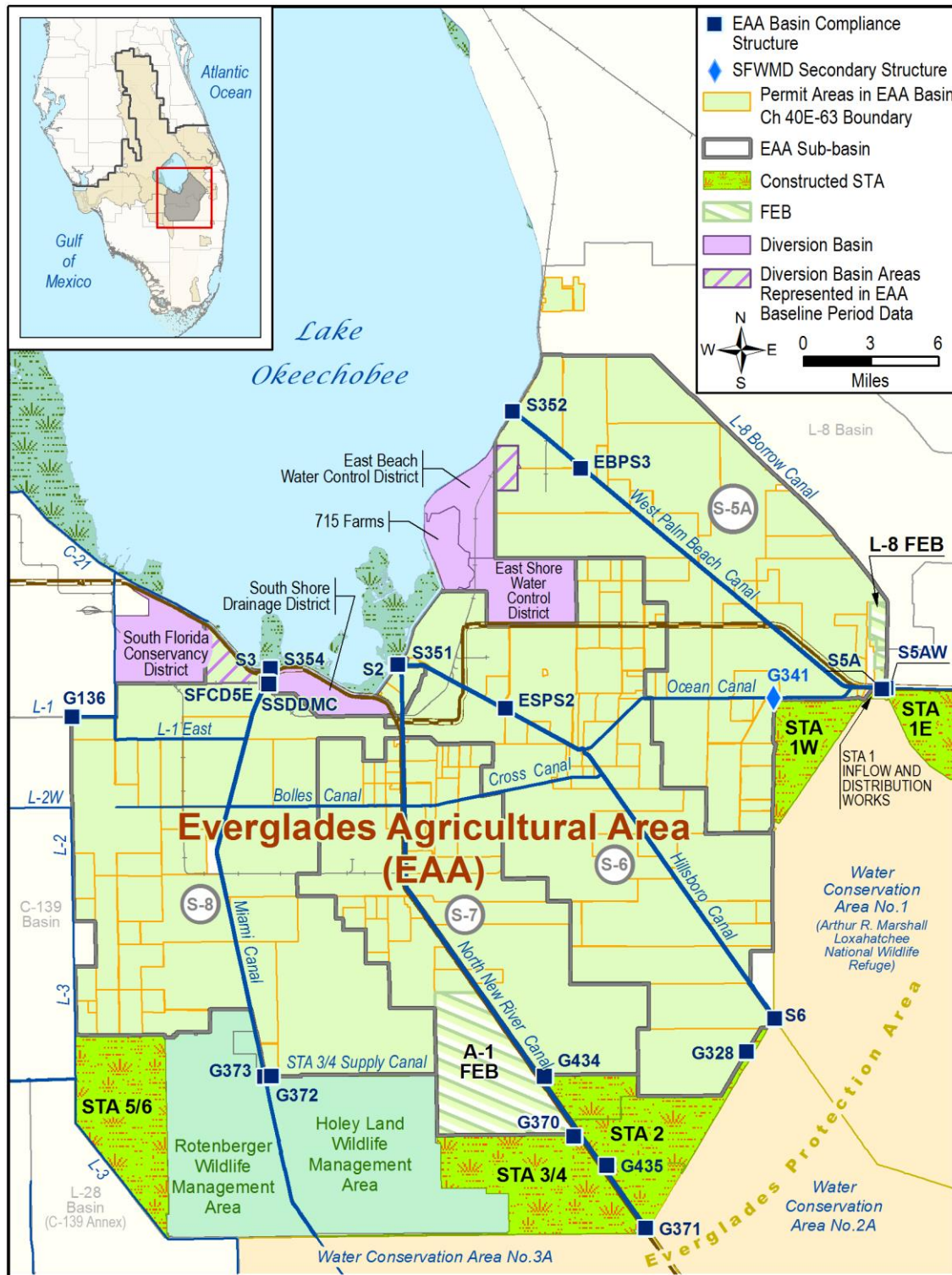


Figure 4-2a. Water Year 2014 (WY2014) (May 1, 2013–April 30, 2014)
Everglades Agricultural Area (EAA) Basin boundaries and
primary compliance water control structures.

[Notes: FEB – flow equalization basin; STA – Stormwater Treatment Areas;
STA 1E – STA 1 East; and STA 1W –STA 1 West.]

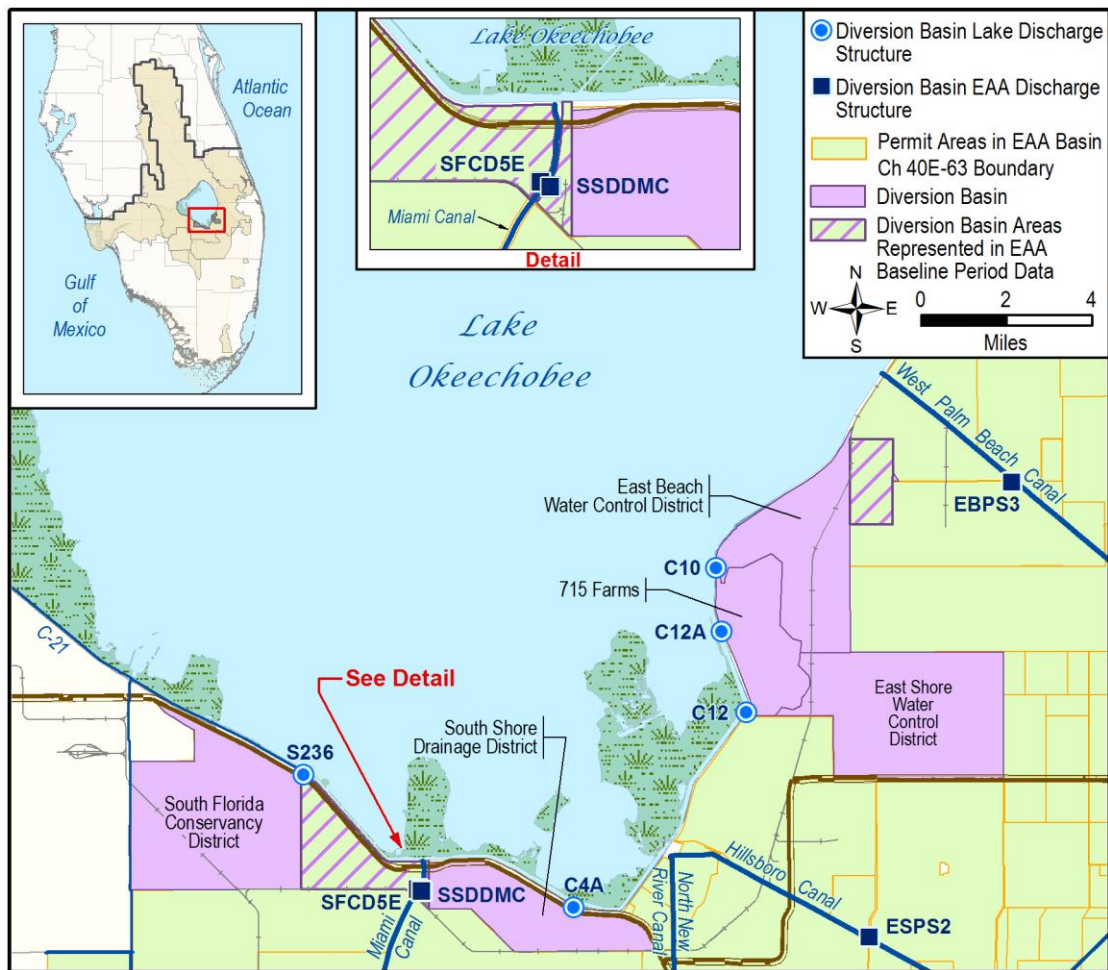


Figure 4-2b. EAA diversion basins boundaries and their discharge structures to Lake Okeechobee and the EAA.

Water Year 2014 Phosphorus Results

This sub-section provides an update on the observed WY2014 TP loads in comparison to the basin's EFA-mandated load requirements as defined by Chapter 40E-63, F.A.C. Additional detailed information on the EAA Basin-level monitoring program and summaries of sub-basin flows, related TP loads, and TP flow-weighted mean concentrations (FWMC) are presented in Appendix 4-2 of this volume.

Table 4-3 provides a summary of the EAA WY2014 results for the observed TP loads and load performance measures in metric tons (mt). The observed load is based on flow and water quality data measured during the water year. The predicted load is established through a base period regression model using the current water year rainfall characteristics to account for the hydrologic variability between the current year and the baseline period, and the target load is the predicted load reduced by 25 percent to reflect the EFA load reduction requirement. Observed loads are assessed based on exceeding the target loads for three consecutive years to verify noncompliance at a theoretical confidence level of 87.5 percent. The single-year limit load is calculated based on the 90th percentile confidence level of the target load. This provides for a

higher theoretical confidence level to verify noncompliance based on exceeding the limit load in a single year. Details of target and limit load calculations and performance evaluation can be found in Appendix 4-2 of this volume and Chapter 40E-63, F.A.C. **Table 4-3** also summarizes TP concentrations in micrograms per liter ($\mu\text{g/L}$) [or parts per billion (ppb)].

Table 4-3. Results of WY2014 Everglades Agricultural Area (EAA) Basin total phosphorus (TP) compliance calculations.

| TP Load | |
|---|---------------------|
| Predicted TP load (adjusted for WY2014 rainfall amounts and monthly distribution relative to baseline period) ¹ | 285 mt |
| Target TP load (predicted TP load reduced by 25 percent) | 214 mt |
| Limit TP load (upper 90 percent confidence limit for target load) | 290 mt |
| Observed WY2014 TP load from the EAA with BMPs implemented | 105 mt |
| WY2014 TP load reduction (relative difference between observed and predicted TP loads) | 63% |
| TP Concentration | |
| Observed EAA average annual TP flow-weighted mean concentration (FWMC) prior to BMP implementation (WY1980–WY1988) ¹ | 173 $\mu\text{g/L}$ |
| Observed WY2014 TP FWMC from the EAA with BMPs implemented | 94 $\mu\text{g/L}$ |

¹The baseline period of record is October 1978–September 1988 in accordance with Everglades Forever Act (EFA) requirements. Under Chapter 40E-63, Florida Administrative Code (F.A.C.) compliance is based on whole water year periods (May 1–April 30) that fall within the October 1978–September 1988 range, that is, WY1980–WY1988 (May 1, 1979–April 30, 1988). mt – metric tons; $\mu\text{g/L}$ – micrograms per liter

Table 4-4 summarizes data for all calculated water years. This table presents observed and predicted TP data and annual rainfall and flow measurements. The TP values presented are attributable only to EAA Basin runoff (farms, cities, and industries) as represented by the EAA basin-level monitoring locations and do not represent the cumulative TP being discharged through the EAA boundary structures from all sources.

Table 4-4. WY1980–WY2014 EAA Basin TP measurements and calculations.

| Water Year | Observed TP Load ¹ (mt) | Predicted TP Load ² (mt) | Percent TP Load Reduction ³ | Annual Rainfall (inches) ⁴ | Annual Flow (10 ³ ac-ft) ⁴ | Annual TP FWMC (µg/L) ⁴ | Baseline and BMP Status Timeline ⁵ | |
|-------------------|---------------------------------------|--|--|---------------------------------------|--|------------------------------------|--|--|
| 1980 | 167 | 154 | -9% | 53.5 | 1,162 | 117 | Baseline Period | Pre-BMP Period |
| 1981 | 85 | 98 | 13% | 35.1 | 550 | 126 | | |
| 1982 | 234 | 255 | 8% | 46.7 | 781 | 243 | | |
| 1983 | 473 | 462 | -2% | 64.4 | 1,965 | 195 | | |
| 1984 | 188 | 212 | 11% | 49.8 | 980 | 155 | | |
| 1985 | 229 | 180 | -27% | 39.7 | 824 | 225 | | |
| 1986 | 197 | 240 | 18% | 51.2 | 1,059 | 151 | | |
| 1987 | 291 | 261 | -12% | 52.0 | 1,286 | 183 | | |
| 1988 | 140 | 128 | -9% | 43.4 | 701 | 161 | | |
| 1989 | 183 | 274 | 33% | 39.7 | 750 | 197 | | |
| 1990 | 121 | 120 | -1% | 40.1 | 552 | 177 | Partial BMPs | Partial BMPs |
| 1991 | 180 | 219 | 17% | 50.4 | 707 | 207 | | |
| 1992 | 106 | 179 | 41% | 47.6 | 908 | 94 | | |
| 1993 | 318 | 572 | 44% | 61.7 | 1,639 | 157 | | |
| 1994 | 132 | 160 | 17% | 50.5 | 952 | 112 | | |
| 1995 | 268 | 388 | 31% | 67.0 | 1,878 | 116 | Everglades Rule BMPs (Full BMP Implementation) | Everglades Rule BMPs (Full BMP Implementation) |
| 1996 ⁶ | 162 | 503 | 68% | 56.9 | 1,336 | 98 | | |
| 1997 | 122 | 240 | 49% | 52.0 | 996 | 100 | | |
| 1998 | 161 | 244 | 34% | 56.1 | 1,276 | 102 | | |
| 1999 | 128 | 249 | 49% | 43.4 | 833 | 123 | | |
| 2000 | 193 | 425 | 55% | 57.5 | 1,311 | 119 | | |
| 2001 | 52 | 195 | 73% | 37.3 | 667 | 64 | | |
| 2002 | 101 | 227 | 55% | 49.1 | 1,071 | 77 | | |
| 2003 | 81 | 125 | 35% | 45.6 | 992 | 66 | | |
| 2004 | 82 | 229 | 64% | 46.8 | 961 | 69 | | |
| 2005 | 182 | 444 | 59% | 51.0 | 1,190 | 124 | | |
| 2006 | 153 | 270 | 44% | 50.1 | 1,035 | 119 | | |
| 2007 | 150 | 182 | 18% | 37.2 | 727 | 166 | | |
| 2008 | 94 | 167 | 44% | 47.0 | 619 | 123 | | |
| 2009 | 129 | 407 | 68% | 43.7 | 877 | 119 | | |
| 2010 | 169 | 288 | 41% | 61.9 | 1,079 | 127 | | |
| 2011 | 45 | 219 | 79% | 42.0 | 517 | 71 | | |
| 2012 | 63 | 217 | 71% | 44.4 | 546 | 93 | | |
| 2013 | 154 | 263 | 41% | 53.5 | 884 | 141 | | |
| 2014 | 105 | 285 | 63% | 53.4 | 899 | 94 | | |

¹ TP values are attributable only to the EAA Basin (farms, cities, and industries) and do not represent the cumulative TP being discharged through the EAA boundary structures from all sources such as Lake Okeechobee and the 298 Districts.

² Predicted TP load represents the baseline period load adjusted for rainfall variability.

³ Percent TP load reduction values for WY1980–WY1988 represent the compliance model calibration period. BMP (Best Management Practice).

⁴ 1 inch = 2.54 centimeters; 10³ ac-ft = thousands of acre-feet; 1 acre-foot = 1,233.5 cubic meters; and 1 microgram per liter (µg/L) = 1 part per billion (ppb).

⁵ 1996 was the first year of compliance measurement for the EAA Basin. BMPs were not fully implemented from WY1992 to WY1995.

The EAA Basin percent TP load reduction trend is presented in **Figure 4-3**. The solid line shows the five-year trend of percent load reduction. The diamond (♦) symbol represents the annual measurements. A downward trend in the solid line in **Figure 4-3** denotes a reduction in loads; that is, an overall long-term improvement in the water quality of EAA Basin runoff discharges.

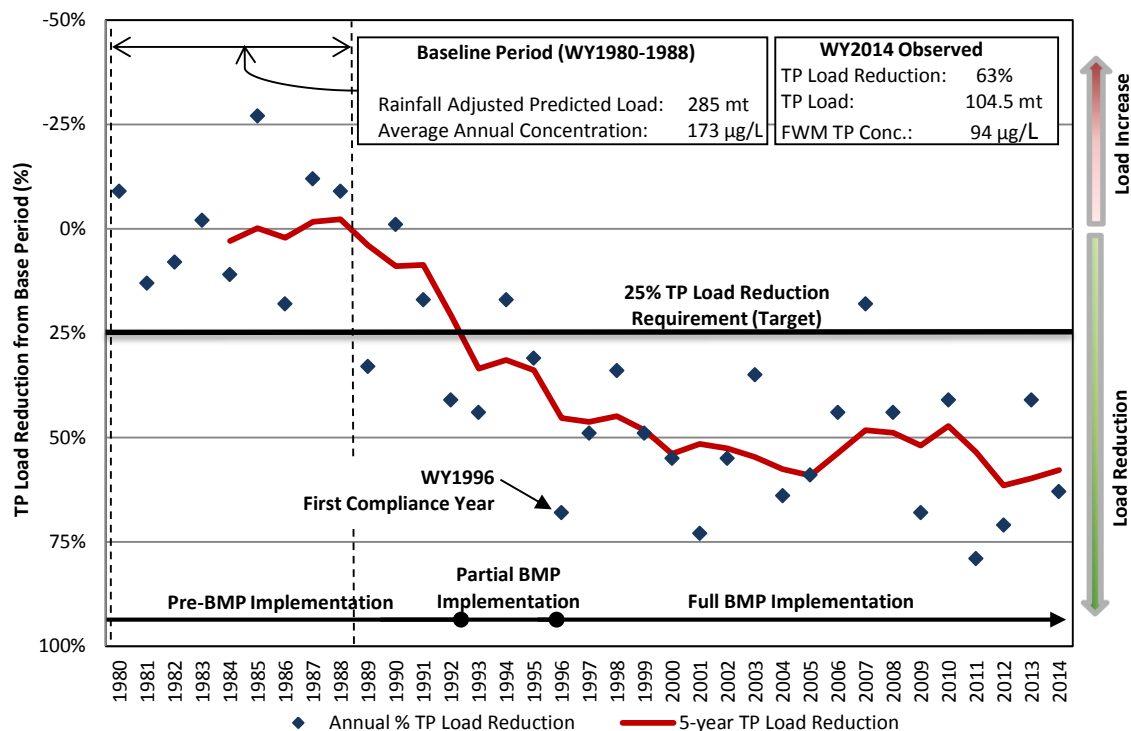


Figure 4-3. EAA Basin percent total phosphorus (TP) load change from baseline period.

[Notes: BMP – Best Management Practice; mt – metric tons; µg/L – micrograms per liter; and 1 µg/L = 1 part per billion (ppb).]

Supplemental evaluation of the EAA data at the basin, sub-basin, and permit levels is presented in Appendix 4-2 of this volume. The supplemental evaluation includes basin-level compliance calculation details, basin-level monitoring data and a water quality summary, discussion of short-term and long-term variations in basin-level loads, permit-level monitoring data, and agricultural privilege tax incentive credit information.

EAA Basin Source Control Strategy

The source control strategy for the EAA Basin relies primarily on an EFA-mandated regulatory program for BMP implementation for which compliance determinations began in WY1996. Chapter 40E-63, F.A.C., requires a permit for a BMP plan for each crop or land use within each sub-basin or farm. In addition, through an adaptive management process, the regulatory program ensures that mandatory BMP implementation and performance measures continue to be applicable in response to regional changes.

The permit-required BMP plans are comprehensive; they address both nutrient input to the system and transport from the system and generally consist of nutrient management, water management, and particulate matter and sediment controls. Changes to the BMP plans require the

District's approval. Permittees are also required to collect water quality and quantity data at farm discharges (permit-level) through approved discharge monitoring plans. [Refer to the 2009 SFER – Volume I, Appendix 4-1 for more information on comprehensive BMP plans and BMP plan examples, and each subsequent annual SFER Volume I, Appendix 4-2 for permit-level water quality and quantity data.] Water quality data collected at the permit level are used as general indicators of individual BMP plan effectiveness and are used as a secondary means of compliance if the EAA is not in compliance at the basin level, as data are not available to quantify individual BMP effectiveness. Additionally, permit-level data cannot be considered in isolation of other potential factors affecting performance.

The original guidance document for BMP design and plan implementation in the EAA is the Procedural Guide for the Development of Farm-Level Best Management Practice Plans for Phosphorus Control in the EAA, Version 1.1, developed by the University of Florida Institute for Food and Agricultural Sciences (UF/IFAS) (Bottcher et al., 1997). Pursuant to the EFA and Chapter 40E-63, F.A.C., requirements, additional research has been conducted by the UF/IFAS via the EAA – Everglades Protection District (EAAEPD) Master Research Permit to improve BMP effectiveness and design. Investigation to improve the selection, design criteria, and implementation of BMPs is ongoing. Updates to UF/IFAS BMP technical references are available at <http://edis.ifas.ufl.edu>. Searching this site for “EAA BMP” provides documents including design criteria for construction (as applicable), operation of BMPs, and farm management applicable to the EAA. The District refers to these updated technical sources when conducting BMP field verifications, advising permittees on improving BMP plans, and reviewing applications for permit renewals every five years. The update on source control activities below describes the current investigations intended to enhance the body of knowledge on BMPs in the EAA. The District's current emphasis is on completion of the research scope proposed by the EAAEPD under an EFA-mandated research permit. The current focus is to evaluate the effectiveness of a comprehensive canal maintenance program combining sediment and floating aquatic vegetation (FAV) controls.

As indicated in the UF/IFAS procedural guide, the industry definition for a BMP is an “on-farm operational procedure designed to reduce phosphorus losses in drainage waters to an environmentally acceptable level” (Bottcher et al., 1997). Based on Chapter 40E-63, F.A.C., permittees are required to revise their BMP plans to enhance performance if the basin as a whole is not in compliance and the secondary performance measure at the individual farm level is not met. Because the EAA Basin has been in compliance each year since the program's inception, the secondary performance measure methodology has not been utilized. However, permittees have revised their BMP plans for specific on-site conditions.

In addition, the strategy in the EAA Basin includes supplemental source control projects for maintaining or improving the current level of performance. The District conducts upstream data collection at tributaries and supplementary analyses of nonagricultural and agricultural sources with the potential to affect basin-wide performance in an effort to determine the most effective adaptive management strategies. Cooperation of landowners and other interested parties is necessary for the successful implementation of source controls beyond those activities required by the regulatory program.

EAA Basin Source Control Activities

During WY2014, the District implemented the ongoing EFA-mandated regulatory BMP program and made progress on supplemental projects as listed below.

Water Year 2014 Activities

- **BMP Regulatory Program.** At the end of WY2014, 467,443 acres were under Everglades Works of the District (WOD) permits in the EAA. Permit compliance activities continued through monitoring report submittals and on-site BMP verifications. BMP inspections were prioritized based on permit-level data, the date of previous inspection, and potential impact due to farm basin location.
- **298 District and 715 Farms Diversion Projects.** Prior to calendar year 2001, areas within the South Florida Conservancy District, South Shore Drainage District, East Shore Water Control District, East Beach Water Control District, and 715 Farms (**Figure 4-2b**) discharged to Lake Okeechobee and therefore were not included in the EAA Chapter 40E-63, F.A.C., regulatory model boundary. Their discharges were not represented by the baseline period data used to determine compliance with the 25 percent TP load reduction requirement for the EAA. Since 1992, for discharges directed to Lake Okeechobee, landowners have been subject to BMP implementation requirements under Chapter 40E-61, F.A.C. In accordance with EFA requirements, from 2001 to 2005, diversion projects were completed to direct a portion of flows from these areas, previously discharging to Lake Okeechobee, to the south for treatment in the EAA STAs and eventual discharge to the EPA. Upon completion of the diversion projects, these areas were able to discharge to the lake and the STAs and thus were to be subject to the water quality requirements of the EFA. Currently, two post-diversion phosphorus reduction measures are required by the EFA for discharges from these areas: diversion of no less than 80 percent of historic flows and TP loads from Lake Okeechobee to the STAs and a 25 percent TP load reduction methodology comparable to that adopted under Chapter 40E-63, F.A.C. The necessary regulatory methods have not yet been adopted by rule to implement the 25 percent reduction requirement. Chapter 40E-63, F.A.C., was included in the District's regulatory plan filed with the Office of Fiscal and Regulatory Reform.
- **West Palm Beach Canal Data Collection.** A canal water quality and flow data collection effort continues within the West Palm Beach Canal (see **Figure 4-2a**) with the objective to further the understanding of phosphorus sources, phosphorus transport mechanisms, and sinks affecting TP loading from the EAA at the sub-basin level. Water quality was collected on 35 trips to nine sites along the canal between the S-352 and S-5A structures, including three intermediate canal locations at which stream gauging was performed for flow estimation.
- **BMP Research.** In addition to the regulatory program, the EFA, Chapter 40E-63, F.A.C. and Chapter 40E-61, F.A.C., require EAA landowners, through the EAAEPD, to sponsor a program of BMP research, testing, and implementation that monitors the efficacy of BMPs in improving water quality in the EPA. The master permit for BMP research, testing, and implementation is the mechanism through which the District implements research and outreach requirements. Meaningful findings that can be incorporated into agricultural practices are essential to meet and maintain the performance goals of the ECP and to optimize the regulatory program. Findings are disseminated to the permittees through UF/IFAS and District outreach efforts, primarily providing BMP implementation options for their consideration. The master permit is issued to the EAAEPD, and research is conducted by the UF/IFAS in Belle Glade. The last permit modification was approved in January 2010 and is valid for 5 years. The approved scope of work focuses on the management of FAV. The main objectives of the research are to (1) evaluate the impact of alternate management practices for the control of FAV in EAA farm canals on farm TP load, and (2) develop improved BMP techniques for FAV management for use in the EAA. The activities under the EAAEPD master permit for WY2014 were as follows:

- BMP training workshops were conducted in September 2013 and April 2014 for growers in the EAA with a total of 190 participants. The April 2014 workshop was conducted in Spanish. Feedback received via evaluations collected after training workshops was positive and was used to modify and improve future training topics, content, and speaker selections. The BMP workshop presentations can be found at the following website: http://erec.ifas.ufl.edu/research/index_soil_and_water.shtml.
- Under the permitted research scope, the following activities have been conducted: (1) bathymetric surveys of main farm canals (November 2013 and April 2014); (2) sediment analyses of main farm canals (November 2013 and April 2014); (3) ambient main canal and drainage water quality monitoring by biweekly grab samples for TP, total dissolved phosphorus, particulate phosphorus, dissolved organic phosphorus, total suspended solids, total dissolved calcium, and pH; (4) bimonthly qualitative and quantitative assessment of FAV biomass from each main farm canal; (5) flow composite sampling of farm drainage water collected and analyzed for every drainage event; (6) monitoring of farm canal drainage flow rates, canal elevations, rainfall, and estimation of farm drainage water velocities during drainage events, and (7) in-situ Hydrolabs to monitor canal water temperature, conductivity, and pH.
- The three-year calibration period for farm pair 4701 and 4702 ended April 30, 2014. A statistical comparison of the farm pairs was completed and treatment and control farms were selected (4701 control farm and 4702 treatment farm). The treatment phase for three pairs of farms began in May 2013. A biweekly evaluation of all eight farms for FAV coverage is conducted and treatment farms are spot-sprayed to control FAV growth. Results will be reported in the 2014 UF/IFAS annual report.
- **Statistical Analysis of Permit Level Data.** Revisions to the Statistical Analysis Software (SAS) tool were completed. The tool will now be used to perform statistical analysis of all permit-level water quality data since WY1995 for long-term trends, seasonality, and statistical outliers.
- **Sub-regional Source Control Projects.** As part of the April 27, 2012, Restoration Strategies Regional Water Quality Preliminary Plan (SFWMD, 2012), the District proposes to build upon the success of the existing mandatory BMP regulatory program by focusing on areas and projects with the greatest potential to further reduce phosphorus loads to the STAs. The existing regulatory program focuses on the source, minimizing pollution leaving the permittee site (basin-ID level). Through this new effort, the District's goal is to design projects to increase retention/detention of phosphorus over and above what is currently required by existing permits through strategic on-site or sub-regional source controls. Reductions in load from these efforts are considered a "safety factor" for enhanced assurance in improving water quality flowing into the STAs. The S5A Sub-basin within the EAA Basin was selected as a priority sub-basin based on the inflow concentrations from Lake Okeechobee into the S5A, the water quality of the farms discharging within the S5A, the potential to affect the inflow to the STAs, and potential positive impact to the Arthur R. Marshall Loxahatchee National Wildlife Refuge. During WY2014, the District made progress on the following projects:
 - **East Beach Water Control District (EBWCD) canal cleaning BMP demonstration and implementation.** The District partnered with EBWCD to implement some of the BMP vegetation control concepts supported by UF/IFAS

research and simultaneously monitor water quality for trends. Project water quality monitoring began May 2013 and cleaning began August 2013.

- **Conceptual Project Formulation.** Analysis of available data, including permit-required submittals and the West Palm Beach Canal Data Collection project discussed above, is being summarized to aid planning of future project efforts within the S5A basin in relation to potential to reduce phosphorus loads.

Anticipated Activities

- **BMP Regulatory Program.** The District's ongoing permit compliance activities will continue to be updated as needed based on new findings. The goal is to encourage permittees to continue to optimize their operations relative to improving water quality through increasing the number of BMP verification visits conducted, and the depth of technical review and information exchange on fertilization and water management plans for the different crops and specific implementation of particulate matter and sediment control BMPs. A District priority is the training of staff, review of technical documentation of the program's standard operation procedures to ensure fair and consistent application of requirements among permittees, and continued improvement in the effectiveness of BMPs to affect TP in discharges.
- **298 District and 715 Farms Diversion Projects.** The District plans to align efforts with the Northern Everglades and Estuaries Protection Program (NEEPP) and FDEP's BMAP development for the portion of the EAA overlapping the Lake Okeechobee Watershed. Through a stakeholder public participation process, the District will review the technical and regulatory details developed to date for potential implementation in these areas, while ensuring consistency with NEEPP related Lake Okeechobee water quality goals.
- **West Palm Beach Canal Data Collection.** The canal water quality and flow data collection effort, as described above, will continue within the West Palm Beach Canal through October 2015, at which time, the data will be analyzed to determine phosphorus sources, phosphorus transport mechanisms, and sinks affecting TP loading from the EAA at the sub-basin level.
- **BMP Research.** The EAAEPD will continue their study of phosphorus loading from EAA farms and the impact of improved FAV and canal management practices. The EAAEPD will also continue to conduct BMP training workshops in addition to the following activities in calendar years 2014 and 2015: (1) sediment analyses for all eight study farms will be conducted in November and April, (2) X-ray diffraction analyses on sediment samples [0–2.5 centimeters (cm)] will be conducted to evaluate the mineralogy of the surface sediments, (3) phosphorus-fractionation analyses will be conducted on sediment samples (0-2.5 cm) for phosphorus species characterization, (4) biweekly sampling of ambient canal and drainage waters, (5) survey and composition analysis of FAV biomass every two months, (6) treatment farms will be inspected every two weeks and water lettuce will be spot sprayed for complete control of its growth, (7) two BMP training workshops, and (8) an annual report and presentation at the EAAEPD Landowners Annual Meeting.
- **EBWCD BMP Demonstration Project.** A canal cleaning BMP demonstration and implementation project is planned to continue through 2015. Water quality data is being collected by the SFWMD and quarterly canal cleaning progress updates are provided by EBWCD. The collected data will be analyzed to determine the effectiveness of enhanced BMP vegetation control concepts.
- **Sub-regional Source Control Projects.** In addition to the EBWCD demonstration project, other projects within the S5A Sub-basin will be considered based on a

combination of factors, including water quality of farm discharges, proximity and potential impact to the STA, and willingness of participants. Coordinating with stakeholders and initiating contracts for design and implementation of source control projects within the S5A basin over and above what is currently required by permits are the priorities for WY2015.

C-139 BASIN UPDATE

During WY2011, amendments to rules within Chapter 40E-63, F.A.C., Part IV, were adopted to provide for a more comprehensive and effective source control program in the C-139 Basin. The amended rule includes requirements for implementation of all defined categories of BMPs (nutrient management, water management, and sediment controls) for all land uses, as applicable. Although basin performance has been computed and reported annually since then, WY2012 was the first water year of compliance determination under the amended rule. Representative monitoring locations for determining WY2014 TP load performance are shown in **Figure 4-4**.

Water Year 2014 Phosphorus Results

Table 4-5 provides a summary of the C-139 Basin WY2014 results for the observed and performance measure TP loads in mt. The observed load is based on flow and water quality data measured during the water year. The target load is pre-BMP baseline period load predicted considering the current water year rainfall characteristics. The target load applies a base period regression model to the current water year rainfall characteristics to account for the hydrologic variability between WY2014 and the base period. The target load model was developed to meet the EFA requirement of maintaining pre-BMP baseline period loading rates. Therefore, the target load is the predicted load. WY2014 was the first year the observed TP load discharged from the C-139 Basin was above the target load from the pre-BMP baseline period adjusted for rainfall, but below the limit. As with the EAA Basin, noncompliance with target loads is evaluated based on exceeding the target load for three consecutive years to verify a theoretical confidence level of 87.5 percent. The single-year limit load is calculated based on the 90th percentile confidence level of the target load. The limit load provides for a higher theoretical confidence level to verify noncompliance based on an exceedance in a single year. Details of target and limit load calculations and performance evaluation can be found in Appendix 4-2 of this volume and Chapter 40E-63, F.A.C. **Table 4-5** also summarizes TP concentrations in µg/L.

Table 4-5. Results of WY2014 C-139 Basin TP performance calculations.

| | TP Load |
|--|------------------|
| Target (predicted) TP load (adjusted for WY2014 rainfall amounts and monthly distribution relative to the baseline period ¹) | 17 mt |
| Limit TP load (upper 90 th percentile confidence level for target load) | 41 mt |
| Observed WY2014 TP load from the C-139 Basin with full implementation of comprehensive BMP plans | 28 mt |
| | TP Concentration |
| Observed C-139 Basin TP flow-weighted mean concentration (FWMC) prior to BMP implementation (WY1980–WY1988) ¹ | 235 µg/L |
| Observed WY2014 TP FWMC from the C-139 Basin with full implementation of comprehensive BMP plans | 181 µg/L |
| Five-year (WY2010–WY2014) TP FWMC | 162 µg/L |

¹The baseline period of record is October 1978–September 1988 in accordance with Everglades Forever Act (EFA) requirements. Under Chapter 40E-63, Florida Administrative Code (F.A.C.) compliance is based on whole water year periods (May 1–April 30) that fall within the October 1978–September 1988 range, that is, WY1980–WY1988 (May 1, 1979–April 30, 1988). mt – metric tons; µg/L – micrograms per liter

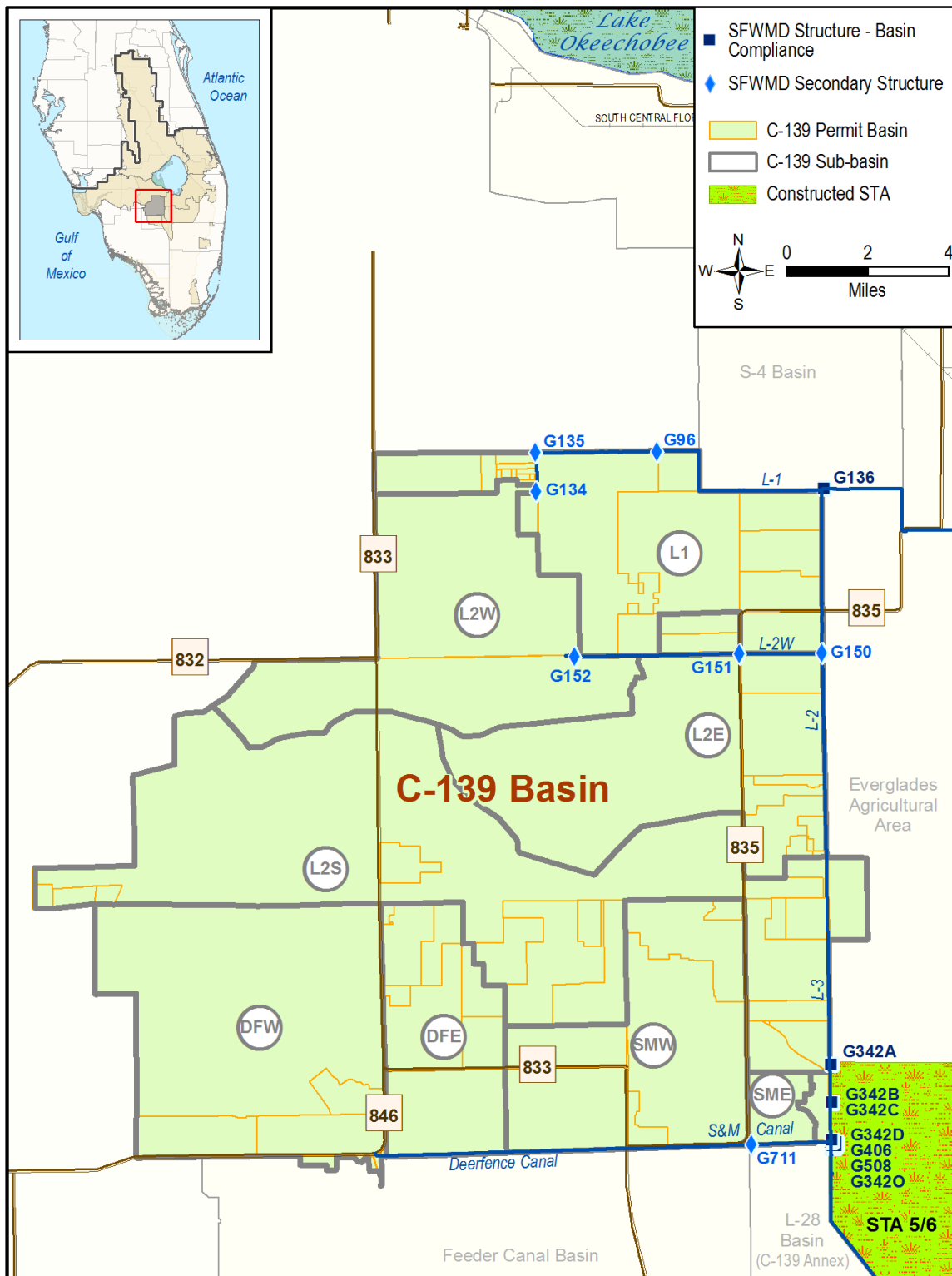


Figure 4-4. WY2014 C-139 Basin boundary and primary compliance water control structures.

Chapter 40E-63, F.A.C., allows for the option of a permit-level discharge monitoring plan to be considered as a secondary performance methodology should the C-139 Basin be determined to not meet overall load performance. None of the permits issued to date include an optional discharge monitoring plan; therefore, only C-139 Basin-level data are reported in this chapter.

Supplemental evaluation of the C-139 Basin data is presented in Appendix 4-2 of this volume. The supplemental evaluation includes performance calculation details, monitoring data, and a water quality summary, as well as a discussion of short-term and long-term variations in basin loads. Individual structure flows, related TP loads, and FWMCs are also presented as an aid to focus BMP source control efforts.

Table 4-6 summarizes data for all calculated water years. This table presents observed and target (predicted) TP data and annual rainfall and flow measurements. The TP values presented in the table are attributable only to the C-139 Basin. **Figure 4-5** shows annual and five-year rolling average trends in TP loads and associated load targets since WY1980. Load targets from WY1980 through WY2010 are based upon the equations adopted in January 2002 and load targets from WY2011 through present reflect amendments in November 2010 to Chapter 40E-63, F.A.C. The TP values presented in this figure are attributable only to the C-139 Basin.

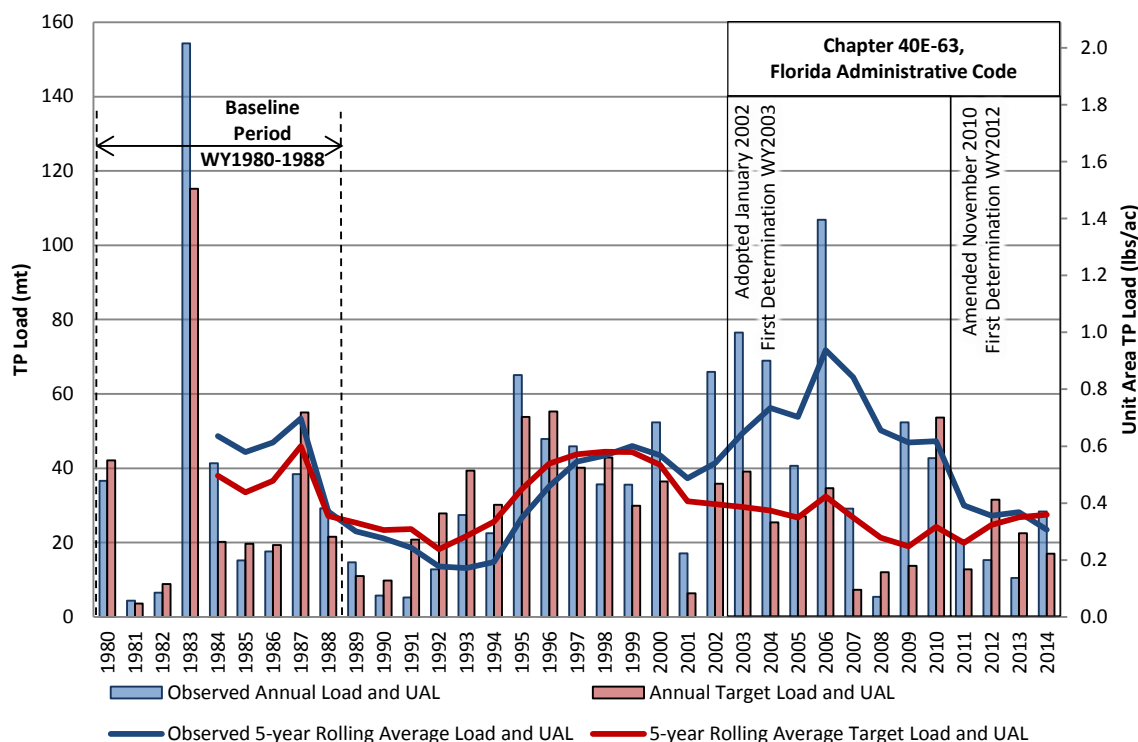


Figure 4-5. C-139 Basin observed and target annual TP load and unit area load (UAL) and five-year rolling averages.

Table 4-6. WY1980–WY2014 C-139 Basin TP measurements and calculations.

| Water Year | Observed TP Load ¹ (mt) | Target TP Load ² (mt) | Limit TP Load (mt) | Annual Rainfall (inches) ³ | Annual Flow (10 ³ ac-ft) ³ | Annual TP FWMC (µg/L) ³ | Baseline and BMP Status Timeline |
|------------|---------------------------------------|-------------------------------------|-----------------------|--|---|---------------------------------------|---|
| 1980 | 37 | 42 | 76 | 56.4 | 172 | 173 | Baseline Period |
| 1981 | 4 | 4 | 7 | 31.1 | 51 | 69 | |
| 1982 | 6 | 9 | 16 | 38.6 | 44 | 120 | |
| 1983 | 154 | 115 | 222 | 72 | 345 | 363 | |
| 1984 | 41 | 20 | 36 | 47.2 | 156 | 215 | |
| 1985 | 15 | 20 | 35 | 46.9 | 63 | 195 | |
| 1986 | 18 | 19 | 34 | 46.7 | 110 | 129 | |
| 1987 | 38 | 55 | 101 | 60.2 | 149 | 208 | |
| 1988 | 29 | 22 | 38 | 48 | 94 | 252 | |
| 1989 | 15 | 11 | 20 | 40.7 | 73 | 163 | |
| 1990 | 6 | 10 | 18 | 39.6 | 46 | 102 | Pre-BMP Period |
| 1991 | 5 | 21 | 37 | 47.5 | 45 | 93 | |
| 1992 | 13 | 28 | 50 | 51 | 100 | 104 | |
| 1993 | 27 | 39 | 71 | 55.5 | 137 | 162 | |
| 1994 | 23 | 30 | 54 | 52 | 137 | 134 | |
| 1995 | 65 | 54 | 98 | 59.8 | 272 | 194 | |
| 1996 | 48 | 55 | 101 | 60.1 | 236 | 164 | |
| 1997 | 46 | 40 | 72 | 55.7 | 165 | 226 | |
| 1998 | 36 | 43 | 77 | 56.6 | 170 | 170 | |
| 1999 | 36 | 30 | 53 | 51.4 | 136 | 212 | |
| 2000 | 52 | 36 | 65 | 54.4 | 202 | 210 | |
| 2001 | 17 | 6 | 12 | 35.6 | 57 | 245 | |
| 2002 | 66 | 36 | 64 | 53.5 | 200 | 267 | |
| 2003 | 76 | 39 | 70 | 54.6 | 224 | 276 | |
| 2004 | 69 | 25 | 45 | 49.1 | 204 | 274 | |
| 2005 | 41 | 27 | 48 | 50 | 168 | 197 | Increasing BMP Implementation Refer to Table 4-7 |
| 2006 | 107 | 35 | 62 | 54.8 | 333 | 260 | |
| 2007 | 29 | 7 | 13 | 36.2 | 77 | 305 | |
| 2008 | 5 | 12 | 22 | 41.6 | 39 | 113 | |
| 2009 | 52 | 14 | 25 | 43 | 165 | 256 | |
| 2010 | 43 | 54 | 98 | 59.8 | 202 | 171 | |
| 2011 | 20 | 13 | 31 | 41 | 106 | 154 | |
| 2012 | 15 | 32 | 74 | 44.5 | 78 | 159 | |
| 2013 | 10 | 22 | 55 | 49.9 | 73 | 116 | |
| 2014 | 28 | 17 | 41 | 46.5 | 127 | 181 | |

1) TP values attributable only to the C-139 Basin.

2) Target (predicted) TP load represents the baseline period load adjusted for rainfall variability. For WY1980–WY2010 Rule 40E-63, Florida Administrative Code (F.A.C.), January 2002, and for WY2011–current Amended Rule 40E-63, F.A.C., November 2010.

3) 1 inch = 2.54 centimeters; 103 ac-ft = thousands of acre-feet; 1 acre-foot = 1,233.5 cubic meters; and 1 microgram per liter (µg/L) = 1 parts per billion (ppb).

4) C-139 Basin compliance determinations under Chapter 40E-63, F.A.C.:

- WY2003 first compliance determination as adopted January 2002

- WY2012 first compliance determination as amended November 2010

C-139 Basin Source Control Strategy

Development of the C-139 Basin source control strategy was modeled after the EFA-mandated regulatory program in the EAA except that it initially allowed more flexible and less comprehensive BMP plans. Those plans were to be modified, incrementally increasing levels of BMP implementation, based on the compliance status with basin phosphorus load levels (targets and limits). The C-139 Basin was unable to meet the historical phosphorus load levels for the first four consecutive years of WY2003 to WY2006.

In 2007, basin-specific constraints were reconsidered. In order to address these challenges, the District conducted technical investigations that included water quality analyses, hydrology evaluations, and demonstration projects.

The District has (1) cost-shared implementation of higher cost technologies, (2) improved the water quality monitoring network, (3) conducted integrated regulatory approaches with consumptive water use and stormwater management system permitting groups within the agency, (4) enhanced stakeholder interaction and outreach, and (5) utilized the Watershed Assessment Model (WAM) to evaluate the feasibility and TP reduction potential of BMPs and source control infrastructure projects.

The results from the activities conducted above and lessons learned from the regulatory program were incorporated into the rule (adopted on November 9, 2010), for a more comprehensive and effective program. The amended rule includes requirements for implementation of a comprehensive BMP plan, that is, includes all defined categories of BMPs (nutrient management, water management, and sediment controls) for all land uses, as applicable. A comprehensive BMP plan will serve to control the different types of phosphorus species (particulate or dissolved), sources, and off-site transport mechanisms. BMP implementation levels and compliance actions since program inception (including the rulemaking process) are summarized in **Table 4-7**.

In addition, the District continues to verify BMP implementation by conducting annual field inspections. The field inspections allow the District to discuss alternative BMP strategies and optimization of current BMP practices with permittees.

Because permittees in the C-139 Basin are not required to collect water quality and quantity data to characterize farm-level discharges, the water quality and quantity monitoring network for upstream areas will be used by the District to differentiate the relative contribution of the hydrologic sub-basins within the C-139 Basin, the timing of releases, and phosphorus species. This information is crucial for developing effective source control strategies into the future. This sub-regional monitoring and data analysis will support water quality improvement activities as needed to achieve consistent compliance with the EFA requirements.

Table 4-7. WY2003–WY2014 C-139 Basin Best Management Practices (BMP) implementation summary.

| Compliance Water Year | BMP Level ¹ | Met Performance | Compliance Action |
|-----------------------|---|------------------|-----------------------------------|
| WY2003 | Initial Implementation of Level I – 15 points | No | Go to Level II Implementation |
| WY2004 | Implement Level II – 15 points with BMP site verifications | No | Go to Level III Implementation |
| WY2005 | Implement Level III – 25 points with BMP site verifications | No | Go to Level IV Implementation |
| WY2006 | Implement Level IV – 35 points with BMP site verifications | No | Initiate Rule Development |
| WY2007 | Continue Level IV | No | Continue Rule Development Process |
| WY2008 | Continue Level IV | Yes | Continue Rule Development Process |
| WY2009 | Continue Level IV | No | Continue Rule Development Process |
| WY2010 | Continue Level IV | Yes | Continue Rule Development Process |
| WY2011 | Comprehensive BMP Plan | Yes ² | Initiate Comprehensive BMP Plans |
| WY2012 | Comprehensive BMP Plan | Yes ² | Comprehensive BMP Plans |
| WY2013 | Comprehensive BMP Plan | Yes ³ | Comprehensive BMP Plans |
| WY2014 | Comprehensive BMP Plan | Yes | Comprehensive BMP Plans |

¹ Increasing BMP levels/points correspond to increased source control implementation.

² WY2011 and WY2012 performance is shown for reference only. Initial Performance Measure Determination Period under amended methodology set forth in amended Chapter 40E-63, Florida Administrative Code (F.A.C.), is WY2013.

³ First Water Year of performance determination under amended Chapter 40E-63, F.A.C.

C-139 Basin Source Control Activities

Water Year 2014 Activities

During WY2014, the District implemented the ongoing EFA-mandated regulatory BMP program and made progress on supplemental projects as listed below.

- **BMP Regulatory Compliance Program.** At the end of WY2014, 163,693 acres (28 permits) were under WOD phosphorus control permits in the C-139 Basin. On-site BMP verifications were conducted for 98 percent of the total permitted acreage. A total of 25 permits covering 160,307 acres were inspected in WY2014. Additionally, District staff conducted BMP training for landowners and operators.
- **C-139 Basin Monitoring Network.** Eight automatic sampling stations collecting TP concentration and flow data were installed in the C-139 Basin to represent runoff from the sub-regions identified in the November 2010 revisions to Chapter 40E-63, F.A.C. The data collected during WY2014 are being reviewed to refine data collection and analysis methods. Phosphorus load calculations for the C-139 sub-basins are summarized in Appendix 4-2 of this volume.

Anticipated Activities

Through the rule amendment process, post-permit compliance activities and other supplementary projects that have encouraged awareness, the C-139 Basin has been overcoming the lag between source control implementation and achieving TP loading performance levels.

However, WY14 results indicate that effective BMP implementation continues to be critical to ensure that historical TP loads are maintained in the long-term, together with targeted water quality improvement projects. Enhancement of the BMP mandatory program will continue with emphasis on supplementary projects to ensure long-term compliance. Planned activities include the following:

- **Continued Post-permit Compliance Activities.** BMP site verifications are an essential component in this phase of the program to ensure long-term compliance through consistent and thorough implementation of comprehensive BMP Plans. Site inspections will focus on the lessons learned from previous demonstration projects as well as technical findings on water quality analysis, hydrology, and modeling.
- **Continued Funding of BMP Demonstration Projects.** Based on funding availability, the direction continues to be toward providing incentives to spearhead landowner-driven BMP demonstration projects to improve effectiveness. It is the intent to maximize the use of funds available for the greatest basin-wide benefits.
- **Continued Data Collection.** Supplementary water quality and quantity data at the sub-basin level will continue to be used to develop a better understanding of upstream contributions and program effectiveness, and to assist with focused remedial action when necessary.

OTHER ECP BASIN UPDATES

This section discusses source control efforts in areas other than the EAA and C-139 basins that discharge to the STAs. These include the L-8 and C-51 West basins in east-central Palm Beach County. While a portion of stormwater runoff from each of these basins is discharged either to tide through the S-155A structure via the C-51 East Basin and Lake Worth Lagoon or to Lake Okeechobee, drainage from each of these basins is also discharged, either directly or via an adjacent basin, to Stormwater Treatment Area 1 West (STA-1W) and Stormwater Treatment Area 1 East (STA-1E). The Village of Wellington (VOW) Acme Improvement District is a sub-basin of the C-51 West Basin. Further background information on these basins can be found in previous SFERs.

C-51 West and L-8 Basins Source Control Strategies and Activities

The District monitors water quality in the C-51 West and L-8 basins to ensure phosphorus loads generated within these basins do not affect the performance of STA-1W and STA-1E. The water quality monitoring programs include monitoring of TP concentration and flows at discharge locations to the C-51 West canal, as required by the VOW Acme Improvement District's Environment Resource Permit (ERP), and upstream monitoring associated with the VOW's phosphorus source control programs. Appendix 4-3 includes a summary of TP concentration data for the VOW Acme Improvement District.

In addition to its upstream water quality monitoring program, the VOW has been administering numerous phosphorus source control activities within the Acme Basin since WY1998. These activities, which include enforcement of VOW-enacted phosphorus source control ordinances regulating equestrian activities within the basin, remain ongoing.

The District will continue to monitor water quality from the C-51 West and L-8 basins and develop future strategies as necessary based on results.

FUTURE DIRECTIONS FOR THE ECP BASINS

District activities as described above will continue in the ECP basins, including BMP site verifications, research and demonstration projects, data collection, and sub-regional projects as outlined in the Restoration Strategies Regional Water Quality Plan (SFWMD, 2012).

STATUS OF SOURCE CONTROL IN THE NON-ECP BASINS

Steve Sarley, Youchao Wang and Carlos Adorisio

Contributor: Cordella Miessau

BACKGROUND

Five basins that discharge directly to the EPA and not through STAs are not part of the ECP and are therefore referred to as non-ECP basins. Four of these basins have discharge structures that are operated and maintained by the District and are permitted by the FDEP under the non-ECP permit. These discharge structures and basins are the S-9 and S-9A (C-11 West canal), S-190 (Feeder Canal), S-140 (L-28 canal), and S-18C, S-332D, and S-174 (C-111 canal). The North Springs Improvement District (NSID) basin is a non-ECP basin capable of discharging directly to the EPA through a pump structure owned and operated by the NSID, formed pursuant to the provisions of Chapter 298, F.S. The location of the non-ECP basins and the associated structures that discharge into the EPA are depicted in **Figure 4-6**. The North New River Canal basin (G-123 structure), reported as a non-ECP basin in earlier SFERs, can no longer discharge to the EPA (see *North New River Canal Basin* sub-section below).

As required by the EFA, these basins have adhered to source control programs and water quality monitoring since WY1998. Specifically, the non-ECP permit requires the implementation of basin-specific WQIPs to ensure progress toward achieving established water quality standards in discharges from each of the non-ECP basins. The WQIPs are consistent with the EFA and are outlined in the Long-Term Plan (Burns and McDonnell, 2003), and its amendments. The WQIPs include the following source control strategies: (1) BMPs, (2) training and educational initiatives, (3) cooperative agreements, (4) modification of stormwater management system permits to include water quality and operational criteria, (5) basin-specific regulatory programs, and (6) full integration with ongoing and future Comprehensive Everglades Restoration Plan (CERP) and other local construction projects.

Also as required by the EFA, the District submitted a long-term compliance permit application to the FDEP in December 2003 that included the 2003 Long-Term Plan. Although the long-term compliance permit has not been issued yet, the EFA requires the District to implement the Long-Term Plan, its amendments, and the Restoration Strategies Regional Water Quality Plan (SFWMD, 2012). The District continues to implement the WQIPs for these basins.

WATER QUALITY SUMMARIES

Water quality in non-ECP basin discharges is monitored to track the success of the WQIPs in each basin with regard to achieving established water quality standards. The distribution of loads from the non-ECP basins to the EPA by water year is presented in **Figure 4-7**. A total TP load of 17.3 mt was discharged to the EPA from the non-ECP basin structures during WY2014 including 1.7 mt from the C-111 Basin, 6.6 mt from the Feeder Canal Basin, 6.2 mt from the L-28 Basin, and 2.8 mt from the C-11 West Basin. Appendix 4-3 provides additional information on TP

loading to the EPA from the non-ECP basins. The NSID basin did not discharge to the EPA during WY2014.

In accordance with the EFA, the non-ECP permit is expected to be modified to require compliance with the TP limits for the Feeder Canal, L-28, C-111, and C-11 West basins. This proposed permit requirement resulted from the EFA mandate that discharge limits be established for long-term compliance permits allowing phosphorus discharges into the EPA.

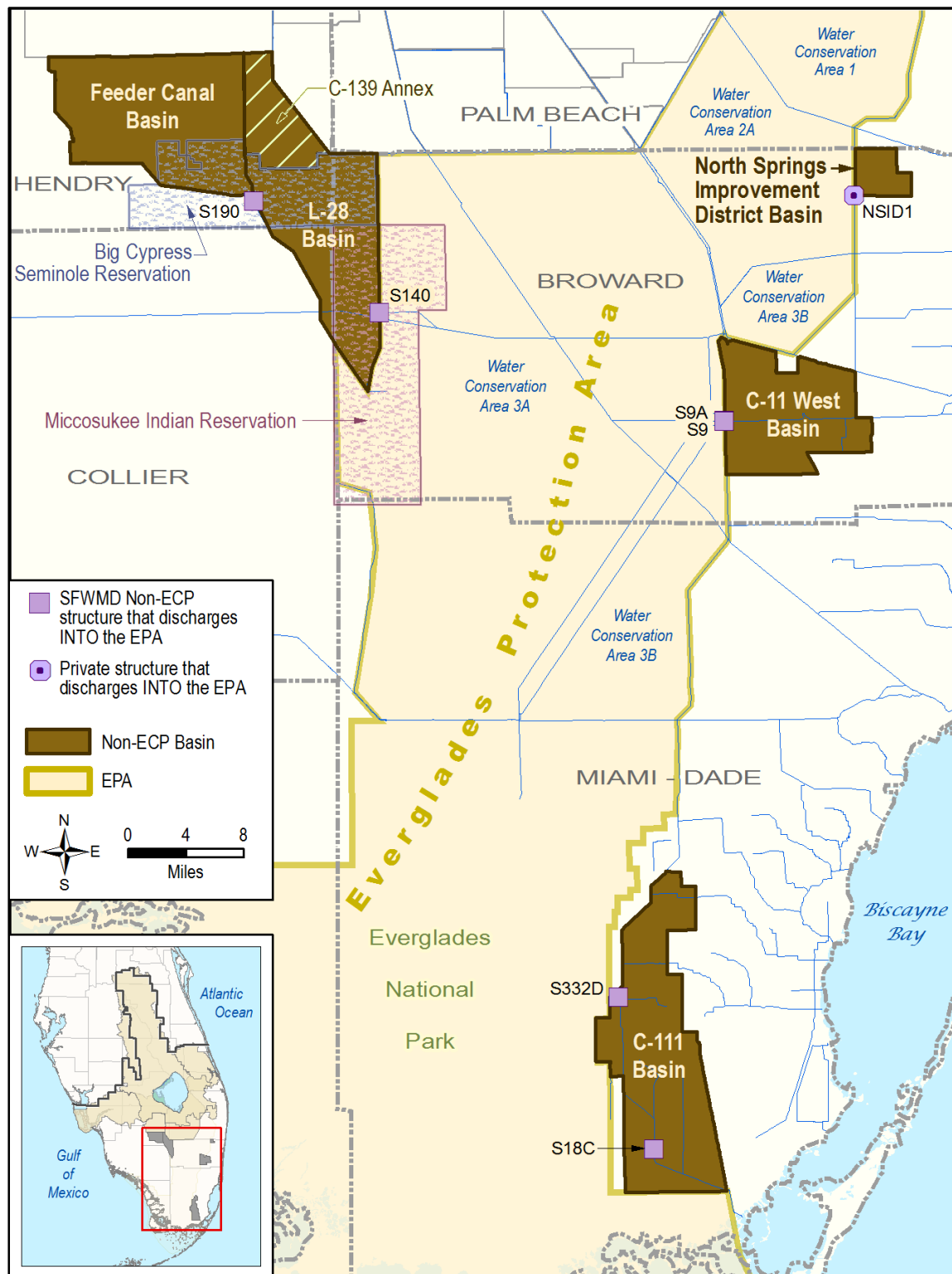


Figure 4-6. The non-ECP basins and structures discharging into the Everglades Protection Area (EPA).

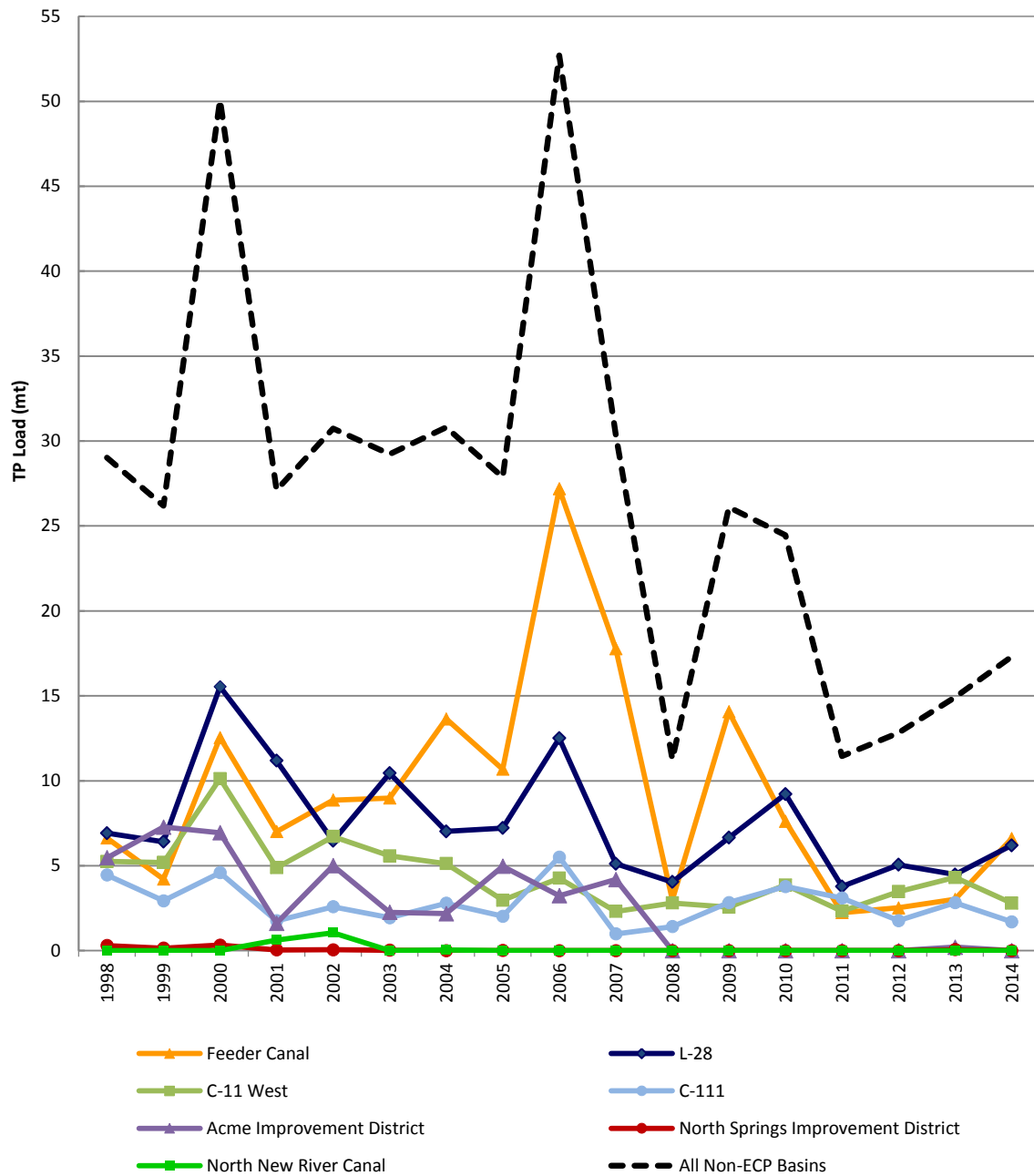


Figure 4-7. Non-ECP basin TP load (mt) into the EPA for WY1998–WY2014.

[Notes: Acme Improvement District basin discharges have been diverted to C-51 West Canal since December 2006; however, 0.2 mt of TP load discharged to the EPA in WY2013 as a result of flood protection measures associated with Tropical Storm Isaac. North New River Canal basin has not discharged to the EPA since WY2004 and pumps were removed circa 2008.]

SOURCE CONTROL STRATEGIES AND ACTIVITIES

During WY2014, the source control strategies for each of the non-ECP basins continued as summarized below. Additional details on these strategies can be found in previous SFERs.

Feeder Canal Basin

Water Year 2014 Activities

- **Rulemaking.** The Long-Term Plan relies on initiation of rulemaking for implementation of a mandatory source control program in this basin should the TP concentration in discharges not achieve a 50 µg/L level. The TP concentration level in discharges from this basin for WY2014 was 76 µg/L (see Appendix 4-3 of this chapter). The District continued to track water quality trends in WY2014 and consider alternatives for implementing source controls such as incentive-based and regulatory programs. The long-term compliance permit renewal application under review by the FDEP may have a bearing on the selected alternative.
- **Seminole Tribe Water Conservation Plan Project.** This project is sponsored by the Seminole Tribe of Florida and is one of the local projects the Long-Term Plan relies on to improve water quality in discharges from the Big Cypress Seminole Indian Reservation into the North Feeder and West Feeder canals. The United States Army Corps of Engineers (USACE) is continuing the planning and construction of the water resource area designated as Basin 2, which together with the completed Basins 1 and 4, and the planned Basin 3, are designed to improve water quality, restore wetland hydrology, increase water storage capacity, and enhance flood protection within the Big Cypress Seminole Indian Reservation. Basins 1 and 4 were completed in August 2008 and August 2013, respectively. Construction of Basin 2 started in December 2013 and is tentatively scheduled to be completed in April 2015. Basin 3 is on hold until further notice.
- **North Feeder Canal Sub-basin.** The Long-Term Plan relies on compliance with the 1996 landowners' agreement between McDaniel Ranch and the Seminole Tribe, which mandates the continued implementation of BMPs on the McDaniel Ranch and meeting a 50 µg/L TP concentration target in stormwater discharges. The agreement requirements also apply to lands formerly owned by McDaniel Ranch as referenced through ERP conditions. The TP level in discharges from this sub-basin for WY2014 was 195 µg/L and is presented in Appendix 4-3 of this chapter. The landowners implemented comprehensive BMP plans as conditions of their ERP and proposed a pilot study associated with the operation of the shared surface water management system. The pilot study objective is to optimize operation and ensure no potential impacts on water quality.
- **West Feeder Canal Sub-basin.** The Long-Term Plan relies on implementation of BMPs and water quality requirements through ERP conditions to achieve 50 µg/L for this sub-basin. TP level in discharges from this sub-basin for WY2014 was 64 µg/L and is presented in Appendix 4-3 of this chapter. Not all properties within the sub-basin are required to have an ERP. In those cases, the District is working cooperatively with landowners to improve water quality through existing requirements under permits and agreements.
- **Big Cypress/L-28 Interceptor Modifications CERP Project.** The Long-Term Plan relies on implementation of this project currently scheduled for completion after 2020 (CERP Band 4, 2020–2025). The project, as planned, would allow discharges from the basin to sheet flow into the L-28 Gap Basin prior to discharge into the EPA (see http://www.evergladesplan.org/pm/projects/proj_10_big_cypress.aspx).

Anticipated Activities

- **North Feeder Canal Sub-basin.** The District will continue working with area owners to improve water quality in discharges through existing permits and the landowner agreement. The District plans to verify the ongoing BMP implementation in all areas of this sub-basin and evaluate water quality data to identify opportunities for improvement. It is anticipated that the implementation of a two-year pilot study will be initiated.

L-28 Basin

Water Year 2014 Activities

- **C-139 Annex Activities.** The C-139 Annex property (17,918-acres) was a citrus grove that was purchased by the District in October 2010, and leased back to the previous landowner (Southern Garden Groves Corporation). The lease was amended in April 2013 to include only 9,148 acres of remaining citrus groves where Southern Garden Groves Corporation continued implementing BMPs during WY2014. The other 8,770 acres include abandoned citrus groves, stormwater management areas, and natural areas. 5,444 acres of the 8,770 acres are currently controlled by the District, while 3,326 acres are still under the control of Southern Garden Groves Corporation. The entire property continues discharging via the USSO structure to the L-28 borrow canal and ultimately to a Miccosukee Indian Reservation area via the S-140 structure within Water Conservation Area (WCA)-3A.

The April 2012 Restoration Strategies Regional Water Quality Plan (SFWMD, 2012) included two projects within this property: (1) a 2,800-acre flow equalization basin (FEB) on the northern portion of the property that will receive flows from the C-139 Basin for detention prior to being discharged back to the C-139 Basin for reuse or to be directed to Stormwater Treatment Area 5/6 (STA-5/6); and (2) A restoration plan for the southern portion of the property that will restore historic Everglades hydrologic conditions to the greatest extent possible. The restoration project for the southern portion is no longer part of a Restoration Strategies Program; however, the project, now known as the Sam Jones/Abiaki Prairie, is being conducted as mitigation for wetland impacts associated with Lake Belt mining in Miami-Dade County, consistent with the goals of the Restoration Strategies Program. Additional information on these projects can be found in the Restoration Strategies Regional Water Quality Plan (SFWMD, 2012) and in Chapter 5A of this volume.

The design phase of the FEB is expected to start in 2017, with construction expected to be completed by 2024. The District is in the process of evaluating leasing opportunities for approximately 1,317 acres of abandoned citrus groves within the footprint of the future FEB. Phase I restoration of the Sam Jones/Abiaki Prairie started in July 2014 and includes 3,449 acres.

- **Miccosukee Tribe Water Management Plan Project.** The Miccosukee Tribe is the local sponsor for this CERP Project. The 2003 Long-Term Plan recommended the accelerated completion of the Miccosukee Water Management Plan by 2010; however, as of August 2014, funding for this project had not been authorized and the project is currently planned after 2015 (CERP Band 3, 2015–2020). The project includes construction of a 900-acre managed wetland within the Miccosukee Tribe reservation and will be designed to accommodate flows and loads from reservation lands only (see http://www.evergladesplan.org/pm/projects/proj_90_miccosukee.aspx).

- **Seminole Tribe Water Conservation Plan Project.** The Seminole Tribe is the local sponsor for this project. The basic nature of the overall plan on the Big Cypress Reservation was originally defined in a February 6, 1995, Conceptual Water Conservation System Design, prepared for the Seminole Tribe of Florida by AMS Engineering and Environmental of Punta Gorda, Florida. This document suggested the development of three Water Resource Areas (WRAs) in that part of the Big Cypress Reservation lying in the L-28 Basin. Those areas (WRA-5, WRA-6 and WRA-7) were intended to treat the runoff from reservation lands. The 2003 Long-Term Plan recommended modification of the plan to convert WRA-7 to an STA by 2010 at a cost of approximately \$20 million; however, as of August 2014, this modification had not been authorized.
- **L-28 Weir Demonstration Project.** Starting in December 2009, the Miccosukee Tribe of Indians of Florida, in cooperation with the District, designed and constructed a weir in the L-28 borrow canal. Results of the demonstration project will be evaluated by the tribe and the District through 2015 to assess the hydrologic and environmental changes that result from the weir construction and hydroperiod enhancements. The report detailing the findings will follow evaluation of the final results.

Anticipated Activities

- **C-139 Annex Activities.** Phase II restoration of the Sam Jones/Abiaki Prairie is expected to start in July 2018 when the lease with Southern Garden Groves Corporation ends and the remaining 9,148 acres of citrus groves are removed.

C-111 Basin

Water Year 2014 Activities

- **C-111 Project.** The District and the USACE are in the final stages of negotiating an agreement that will include plans to start the construction of the North Detention Area in WY2016 or earlier if funding becomes available.

Broward County C-11 West and North Springs Improvement District Basins

Water Year 2014 Activities

- **Broward Everglades Working Group.** The District continued its support of Broward County water quality improvement initiatives within the basins through its participation in this working group. The District continued assisting Broward County in its efforts to ensure implementation of the C-11 West Basin Pollution Reduction Action Plan of April 2006, a compilation of C-11 West Basin stakeholder action plans developed to reduce phosphorus discharges to WCA-3A.
- **Broward County Water Preserve Area CERP Project.** The Long-Term Plan relies on implementation of this project, which is expected to significantly reduce flows to WCA-3A and consequently reduce the C-11 West TP load to WCA-3A. The schedule of this project has been delayed and funding is still pending authorization by congress. For more details on this project, see www.evergladesplan.org/pm/projects/proj_45_broward_wpa.aspx.

- **NSID ERP Requirements.** In 2009, the District issued a modified ERP to NSID requiring implementation of a BMP plan to improve upstream water quality within the basin through public outreach and NSID's surface water management permit requirements and operational changes at the NSID1 pump station to allow discharges to the EPA only after significant rainfall event. The ERP also required water quality monitoring. These requirements continued through WY2014 and no discharges to the EPA were necessary.
- **Hillsboro Site 1 Impoundment (Fran Reich Preserve) CERP Project.** The Long-Term Plan relies on implementation of this project, which is expected to significantly enhance the capacity of the Hillsboro Canal to receive runoff after storm events and consequently reduce the need for NSID to discharge to the EPA. Construction of Phase I of this project started in 2012 and is scheduled to be completed in 2015. However, start and completion of Phase II is unknown as it needs congressional reauthorization. For more details on this project, see http://www.evergladesplan.org/pm/projects/proj_40_site_1_impoundment.aspx.
- **Public Outreach and Education:** Links to the District's Everglades (www.sfwmd.gov/everglades/) and water conservation (www.sfwmd.gov/watersip/) information websites and Broward County's NatureScape website (www.broward.org/NaturalResources/NatureScape/) continue to be provided on the websites of most Broward County stakeholders.

North New River Canal Basin

Water Year 2014 Activities

- **Removal of G-123 Structure.** Structure G-123 had not discharged since WY2004 and the structure pumps were removed circa 2008. The structure's pumps have not been replaced and the District has determined the structure is no longer needed. Therefore, the North New River Canal basin cannot discharge to the EPA and will no longer be considered a non-ECP basin.

FUTURE DIRECTIONS FOR NON-ECP BASINS

Consistent with the EFA, the District will continue to track WQIP implementation and work cooperatively with local governments, the Seminole Indian Tribe of Florida, the Miccosukee Tribe of Indians of Florida, and other state and federal agencies to ensure essential components of the WQIPs are completed as scheduled. Because the schedules of some CERP and other local construction projects have changed as a result of resource constraints, the Long-Term Plan needs to be updated to reflect the new schedules. The District will work with the FDEP to ensure these changes are incorporated in the long-term compliance permit. This permit, when issued, is expected to supersede the non-ECP permit and may establish additional compliance requirements for the non-ECP basins.

OVERVIEW OF NORTHERN EVERGLADES SOURCE CONTROL PROGRAMS

Randall McCafferty, Steffany Olson and Pamela Wade

Contributor: Lacramioara Ursu

In the NEEPP statute, the legislature found that the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds are critical water resources; that watershed changes have resulted in adverse changes to the hydrology and water quality of Lake Okeechobee, and the Caloosahatchee and St. Lucie rivers and their estuaries; and improvement to the hydrology, water quality, and associated aquatic habitats within the watersheds is essential to the protection of the Greater Everglades ecosystem. The NEEPP includes a phased, comprehensive, and innovative protection program composed of integrated approaches to meet these needs: source control programs, construction projects, and research and water quality monitoring programs.

This chapter contains the annual progress report for the Lake Okeechobee, Caloosahatchee and St. Lucie River watershed District source control programs. Discharge data for phosphorus and nitrogen, as applicable, in runoff from the Northern Everglades sub-watersheds up to WY2014 are provided in this section. Additional data and supporting information is provided in Appendix 4-1. Pursuant to the NEEPP, every three years, specified components of the watershed protection plans must be evaluated and any needed modifications identified. The most recent three-year river watershed protection plan updates are found in Volume I, Chapter 10 of this report. The most recent three-year update of the Lake Okeechobee Watershed Protection Plan was presented in Chapter 8 of the 2014 SFER. Additional information on Lake Okeechobee and the river watersheds are found in Chapters 8 and 10 of this volume, respectively.

The District, FDEP, and Florida Department of Agriculture and Consumer Services (FDACS) (the coordinating agencies) are directed by the NEEPP to implement pollutant control programs that are designed to be multifaceted approaches to reducing pollutant loads to the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds. The pollutants of concern in the Northern Everglades are phosphorus in the Lake Okeechobee Watershed and both phosphorus and nitrogen in the river watersheds. The programs include implementation of regulations and BMPs, development and implementation of improved BMPs, improvement and restoration of the hydrologic function of natural and managed systems, and utilization of alternative technologies for pollutant reduction.

The coordinating agencies perform their responsibilities in concert, through an interagency memorandum of understanding (MOU), which was updated in April 2011 and is currently being revisited in light of FDEP's overarching authority in Northern Everglades restoration through the development and implementation of Basin Management Action Plans (BMAPs). The MOU establishes the role of each agency in accordance with the statutory authority of the NEEPP. **Table 4-8** identifies the coordinating agency (or other entity), program, and type (non-point or point) of programs in place or being developed to address nutrients in the Northern Everglades. The success of the nutrient control strategies is dependent upon a comprehensive source control approach and consistency between watersheds while factoring in the unique needs and characteristics of each region.

Table 4-8. Nutrient control programs within the Northern Everglades.

| Lead Agency | Program ¹ | Non-Point | Point |
|--|---|-----------|-------|
| South Florida Water Management District (SFWMD) | Works of the District BMP Program ² – Chapter 40E-61, Florida Administrative Code (F.A.C.) | √ | √ |
| | Environmental Resource Permitting Program – Chapter 373, Florida Statutes (F.S.), Part IV | √ | |
| | Dairy remediation projects ³ | | √ |
| | Dairy Best Available Technologies Project ³ | | √ |
| Florida Department of Agriculture and Consumer Services (FDACS) | Agricultural BMP Program – Chapter 5M-3, F.A.C. | √ | |
| | Animal Manure Application – Chapter 5M-3, F.A.C. | √ | |
| | Urban Turf Fertilizer Rule – Chapter 5E-1, F.A.C. | √ | |
| Florida Department of Environmental Protection (FDEP) | Dairy Rule/Confined Animal Feeding Operation (CAFO) – Chapter 62-670, F.A.C. | | √ |
| | Environmental Resource Permitting Program – Chapter 373, F.S. Part IV | √ | |
| | Stormwater Infrastructure Updates and Master Planning – Chapter 187, F.S. | √ | |
| | Municipal Separate Storm Sewer System Permit Program – Chapter 62-624, F.A.C. | | √ |
| | Comprehensive Planning – Land Development Regulations – Chapter 163, F.S. Part II | √ | |
| Florida Department of Health (FDOH) | Biosolids Rule – Chapter 62-640, F.A.C. | √ | |
| | Application of Septage – Section 373.4595, F.S. | √ | |
| University of Florida Institute of Food and Agricultural Sciences ⁴ (UF/IFAS) | Florida-Friendly Landscaping™ Program – Section 373.185, F.S. | √ | |

¹ Applicable to all three watersheds except where noted in the other footnotes below.

² The rule currently applies to the Lake Okeechobee Watershed. However, as directed by the Northern Everglades and Estuaries Protection Program (NEEPP), the rule will be amended to include the river watersheds.

³ Applicable to only the Lake Okeechobee Watershed.

⁴ Partially funded by the FDEP.

While nutrient control programs within the Northern Everglades include point and nonpoint source control programs by the coordinating agencies, the focus of this chapter is implementation of source control BMP programs by the District in the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds. Regulatory source control programs have historically been demonstrated as the foundation for cost-effective strategies for reducing nutrient loads in runoff. The District's existing WOD program under Chapter 40E-61, F.A.C. was in place prior to establishment of the NEEPP. It was originally authorized by the Surface Water and Improvement Management Act (1987), which eventually became the NEEPP in 2007. The purpose of Chapter 40E-61, F.A.C., is to establish permitting criteria to ensure that the uses of WOD within the watershed are compatible with the District's ability to implement Chapter 373, F.S., to protect water quality. Specifically, this program requires users of WOD in the Lake Okeechobee Watershed to reduce phosphorus at the source, which minimizes transport in runoff so that water quality-based limits can ultimately be met in downstream receiving bodies as applicable. The program is carried out through issuance of permits approving phosphorus control plans, inspections to verify compliance with permit conditions, monitoring water quality, prioritizing areas of water quality concern, and providing incentives to users of WOD to implement additional water quality improvement activities. The majority of the Chapter 40E-61, F.A.C. WOD permits renew automatically unless the District notifies the permittee otherwise. The only exception is the Management Plan Master Permit for which the duration is 5 years and the permittee must apply for renewal of the permit. Chapter 40E-61, F.A.C., includes water quality monitoring requirements at the parcel-level based on the 1989 Interim Lake Okeechobee Surface Water Improvement and Management Plan (SFWMD, 1989a). The NEEPP directed that the coordinating agencies to develop BMPs and programs that complement the existing regulatory programs and that specify how those BMPs will be implemented and verified.

Refinements to Chapter 40E-61, F.A.C., however, are necessary to incorporate the supplemental requirements under the NEEPP and the revised agency roles under the BMAP regulatory framework. The existing Chapter 40E-61, F.A.C., water quality requirements were developed prior to the establishment of the Lake Okeechobee, Caloosahatchee River, and St. Lucie River legislative requirements and current understanding on the efficiency of BMPs. The 1989 rules require that each agricultural and nonagricultural discharger meets a concentration limit at the point of discharge from their property. The rule establishes that District funds may be used to cover the cost of water quality monitoring as long as the water discharged from the site is in compliance with the criteria established by rule. It is through District-funded monitoring of these discharges that water quality problems are currently being detected and addressed by the appropriate agency. The coordinating agencies meet routinely to discuss source control implementation and areas of water quality concern. The NEEPP requires the coordinating agencies to institute a reevaluation of the BMPs and make appropriate changes to the rule where water quality problems are detected despite BMP implementation to assure an adaptive management approach to achieving water quality goals. It is anticipated that the FDEP will take on the leadership role of evaluating the collective BMP programs' effectiveness based on their BMAP regulatory authority, while Chapter 40E-61, F.A.C., will continue to focus on water quality monitoring for the watersheds and for District permitted discharges. In addition to the modifications identified above, changes have been identified for Chapter 40E-61, F.A.C., to incorporate NEEPP mandates that modify the boundary of the program through the inclusion of the Upper Kissimmee Sub-watershed, Lake Istokpoga Sub-watershed, Caloosahatchee River Watershed, and St. Lucie River Watershed (**Figure 4-8**), and to address the nutrients of concern for the river watersheds, which may include nitrogen as well as phosphorus. **Figures 4-9 through 4-11** present the source control program implementation areas for the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds.

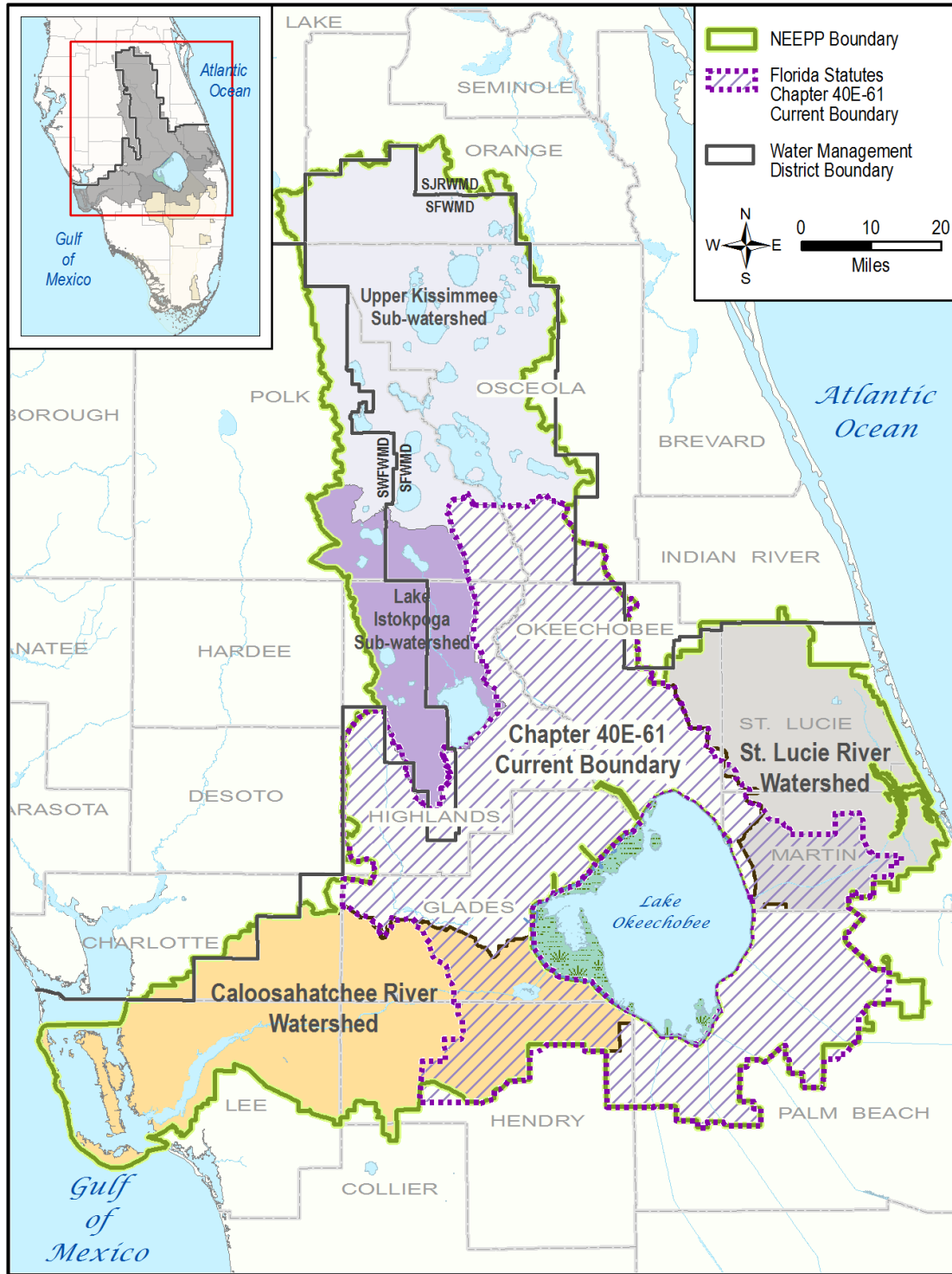


Figure 4-8. Boundary changes resulting from the NEEPP.

[Notes: S.F.W.M.D. – South Florida Water Management District;
S.J.R.W.M.D. – St. John’s River Water Management District; and
S.W.F.W.M.D. – Southwest Florida Water Management District.]

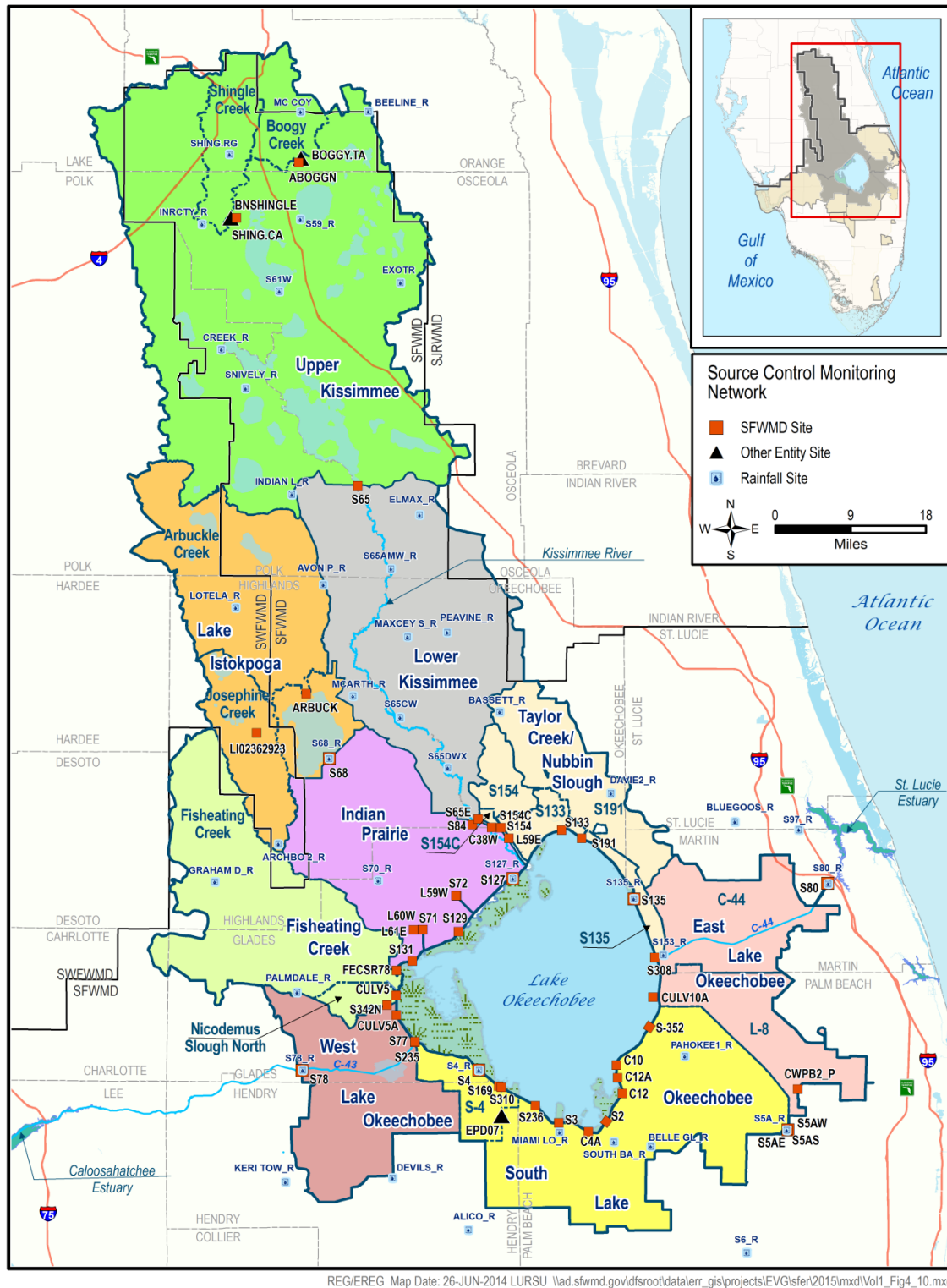


Figure 4-9. Lake Okeechobee Watershed source control program implementation area.

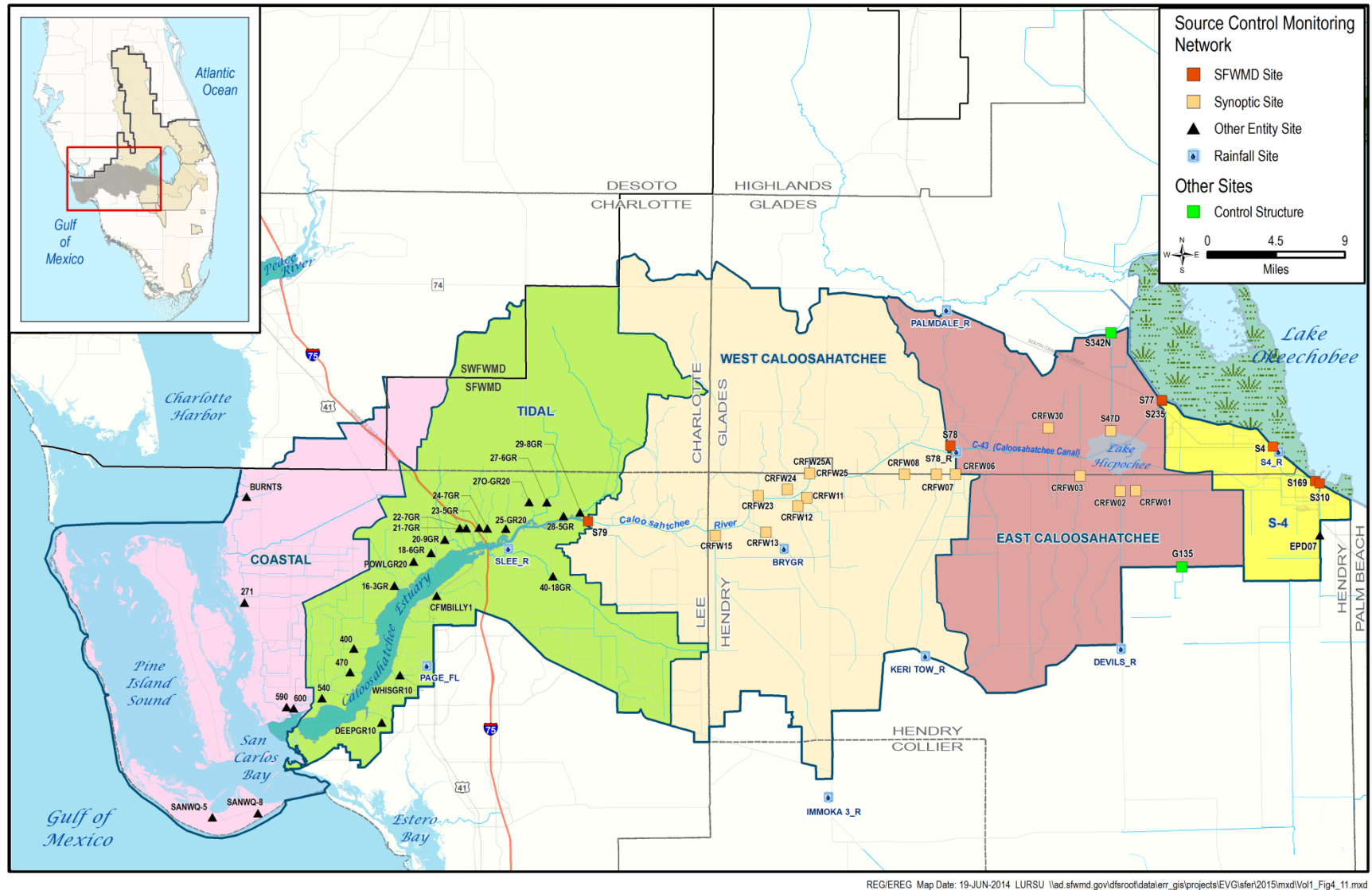


Figure 4-10. Caloosahatchee River Watershed source control program implementation area.
 [Notes: CO – county; and EPD – Everglades Protection District.]

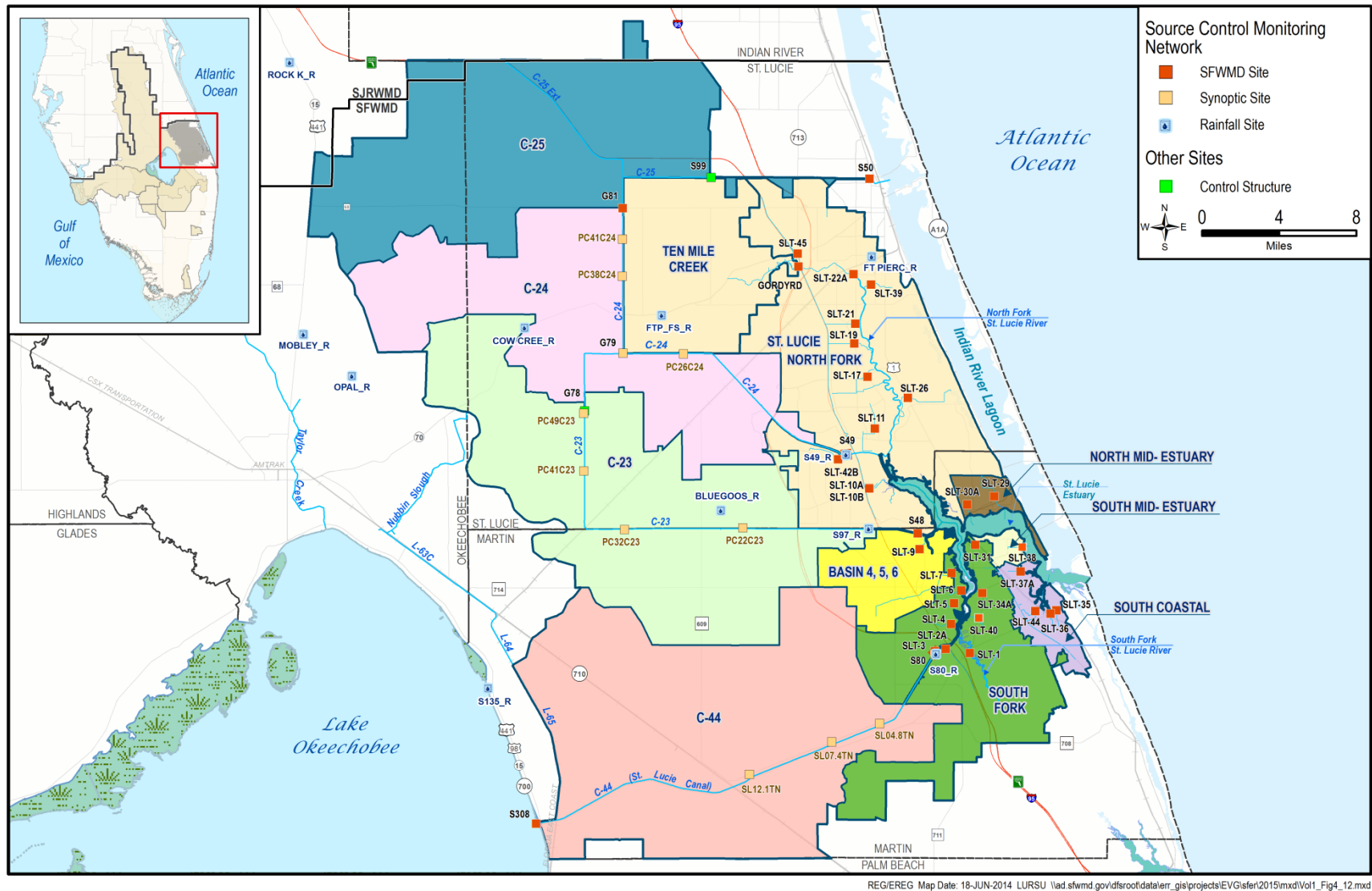


Figure 4-11. St. Lucie River Watershed source control program implementation area.

STATUS OF SOURCE CONTROLS IN THE NORTHERN EVERGLADES WATERSHED

Jodie Hansing, Chad Rucks¹, and Ximena Pernet

Contributors: Steffany Olson, Carmela Bedregal
and Randall McCafferty

BACKGROUND

Implementation of mandatory BMPs for control of nutrients occurs through the District's Regulatory Nutrient Source Control Program and through the ERP Program for areas with delegated authority from the FDEP and are implemented on both agricultural and non-agricultural lands.

The objective of the Regulatory Nutrient Source Control Program is to establish permitting criteria for approval of a BMP plan for new and existing activities to ensure that water quality in stormwater discharges to works of the District are compatible with the District's ability to implement statutory mandates and meet regulatory requirements posed on the District by the FDEP. The regulatory program (also known as the WOD program) is unique to South Florida in that it combines a cost-effective technology based remedy (BMPs) with watershed-specific water quality monitoring requirements. The program prescribes deadlines for action, requirements for controlling phosphorus, water quality monitoring, and compliance methodologies. It is the water quality monitoring requirements and implementation deadlines that set the WOD program apart from other source control programs utilizing BMPs. Compliance with permit conditions is verified through review of water quality data and periodic on-site inspections and records review. Permits are renewed automatically every three years; however, the District has the ability to update existing permitted implementation approaches, as needed to ensure consistent compliance with District criteria, by notifying the permittee prior to the permit expiration date.

In parallel, the ERP Program requires that new activities provide reasonable assurances that they will not "adversely affect the quality of receiving waters such that state water quality standards will be violated." Currently, in the case of Northern Everglades basins, where the existing ambient water quality does not meet standards due to phosphorus impairment, an applicant must implement mitigation measures that are proposed by or acceptable to the applicant that will cause net improvement of the water quality in the receiving waters for those parameters that do not meet standards." Additionally, applicants must demonstrate that their activities will not cause "adverse water quality impacts to receiving waters or adjacent lands" or "flooding to on-site or off-site properties" (see Rule 62-330.301, F.A.C.). However, not all activities are required to obtain ERPs. For example, certain agricultural activities may be exempt pursuant to Section 373.406, F.S. Other exemptions are set forth in Sections 373.4145(3) and 403.813(1), F.S., and Rule 62-330.051, F.A.C. Most lands used for improved pasture, which is approximately 20 percent of the Lake Okeechobee Watershed, do not have ERPs. Additionally, depending on when the stormwater management system was permitted, the water quality design criteria may differ, that is, older stormwater system design criteria may be less stringent. The WOD-permitted BMP plans are even more important in these situations. Approximately 45 percent of the Lake Okeechobee and Caloosahatchee River watersheds and 70 percent of the St Lucie River Watershed are covered by ERPs including water quality and quantity criteria in effect at the time of issuance.

¹ Contributed as SFWMD staff during draft production.

Both the ERP and WOD program were intended to supplement each other by addressing water quality issues with the enforceable regulatory tools the District has at its disposal. This strategy has not been fully implemented for various reasons. This section provides the annual update for the District's Regulatory Source Control Program for the Lake Okeechobee, St. Lucie River, and Caloosahatchee River watersheds.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT NUTRIENT SOURCE CONTROL PROGRAM

The District is currently mandated to implement a Regulatory Source Control Program for phosphorus as adopted under Chapter 40E-61, F.A.C., within the majority of the Lake Okeechobee Watershed. The rule requires agricultural and non-agricultural land uses to be permitted, some must apply and others are granted permits by rule. The 40E-61 regulatory boundary is approximately 2,039,367 acres and of that approximately 86 percent is permitted (Individual, General, and No Notice permits). Permitted acreage includes all areas contributing runoff, which may include natural areas. In the most recent years, permitting efforts within the rule-defined area were scaled back because of limited resources and to allow staff to focus on developing technical documents in support of rulemaking. During this transition period of rule development efforts, the District has relied upon the FDACS to enroll landowners in the statewide voluntary agricultural BMP program. The WOD rule currently does not address the Upper Kissimmee and Lake Istokpoga basins, or the river watersheds; however, the NEEPP mandates that the program be expanded to include the entire Lake Okeechobee and river watersheds and that it encompasses phosphorus and nitrogen in the St. Lucie River and Caloosahatchee River watersheds. In response, the District is developing technical support documents for the source control component adopted by the protection plans for these watersheds. This past year was spent advancing the activities and technical analyses necessary to initiate rule development. The NEEPP also mandates the cooperative agreement referred to as the MOU between the coordinating agencies be amended incorporating roles and responsibilities associated with implementation of the NEEPP. The District is moving forward with the rule amendment process taking into account that the BMAP for Lake Okeechobee was adopted and agency roles are being revised given the overarching authority of the FDEP under the BMAPs.

In addition to the rulemaking activities, staff continued to carry out the core permit compliance activities required under Chapter 40E-61, F.A.C., Lake Okeechobee Watershed assessment monitoring, initiating an upstream monitoring network in the river watersheds, and implementing BMPs that would reduce nutrient loads in runoff from District-owned leased lands, as described in the *SFWMD Activities* section below. Water quality updates for each of the basins that make up the three watersheds in the Northern Everglades are also presented in the *Water Year 2014 Water Quality Update* section below.

SFWMD Activities

BMP Regulatory Program

- The District's permitting and compliance activities under Chapter 40E-61, F.A.C., were implemented. When received, source control permit applications were processed in accordance with mandated regulatory deadlines and comprehensive BMP plans consistent with those required for the Southern Everglades under Chapter 40E-63, F.A.C., were issued.
- For all three watersheds, the District continued coordination with the FDACS to identify agricultural areas not enrolled to implement BMPs and determine how those areas will be addressed through the development of agency action plans.
- The District continued developing a program to improve BMP efficiencies on District-owned lands leased for agricultural uses. Implementation of specific BMPs on District-owned lands is required by the terms of the lease consistent with the intended use of the land. Prospective properties are being evaluated based on multiple factors such as, location, past and present land use, size, and lease expiration date. Potential future projects are under consideration in the Lake Okeechobee, St. Lucie River, and Caloosahatchee River watersheds.
- Under Chapter 40E-61, F.A.C., the District administers the Lake Okeechobee Management Plan Master Permit. The permit historically required implementation of point and nonpoint phosphorus control activities in the EAA, L-8, and S-4/Industrial Canal basins to reduce the average annual phosphorus loading to Lake Okeechobee. Much of the permitted area is in the EAA as described in the *Everglades Agricultural Area Basin Update* section of this chapter.

Monitoring and Assessment

- Monitoring was conducted at Northern Everglades water quality sites for tracking trends (**Figures 4-9** through **4-11**). The sites monitored include both basin-level monitoring and upstream level monitoring (e.g. Lake Okeechobee Watershed Assessment). The WY2014 monitoring data, along with other ambient monitoring network data (TP concentration only) were used to meet the compliance monitoring requirements under Chapter 40E-61, F.A.C., and to highlight areas of concern within the watersheds to the coordinating agencies during quarterly meetings. These data are presented in the *Water Year 2014 Water Quality Update* section below and Appendix 4-1 of this volume.
- Synoptic water quality monitoring at locations within the St. Lucie C-23, C-24, and C-44 basins and the East and West Caloosahatchee basins will begin in WY2015. This two-year project is intended to identify priority upstream monitoring locations within the river watersheds that will be used in a similar manner to the Lake Okeechobee Watershed Assessment stations.
- The collection of stream gauging flow measurements for St. Lucie River tributary stations concluded in WY2014. The additional measured flow conditions were used to optimize the flow rating curves and improve the historical data sets.

Rule Development

- The District's regulatory plan, which was filed with the Office of Fiscal and Regulatory Reform, was updated to include future proposed amendments to Chapter 40E-61, F.A.C.

- The coordinating agencies drafted proposed amendments to the MOU describing the roles and responsibilities between the District, FDACS, and FDEP associated with implementation of the NEEPP and the BMAPs.
- The District continues to develop technical information to support District rulemaking in the Northern Everglades. This included defining and evaluating the watershed monitoring networks to be used for regulatory and other purposes. Evaluation of WY2014 data can be found in the *Water Year 2014 Water Quality Update* section below.

Water Year 2014 Water Quality Update

Analyses of water quality trends were conducted for the Northern Everglades basins. **Figures 4-9 through 4-11** depict the locations where water quality and flow are monitored throughout the Northern Everglades and are used to track progress. Appendix 4-1 of this chapter provides flow schematics depicting hydrologic basin boundaries, flow transfers between basins, water control structures associated with the water quality and flow data used for nutrient load calculations, and the water quality tributary stations.

Tables 4-1 and 4-2 provide a summary of the data observed for WY2014 including, load, unit area load (UAL), and nutrient concentrations for each basin. The individual tributaries monitored for water quality throughout the Northern Everglades are summarized in Appendix 4-1. The following sections illustrate nutrient loading over the period of record for basins within the Lake Okeechobee Watershed (**Figures 4-12 through 4-22**), Caloosahatchee River Watershed (**Figures 4-23 through 4-28**), and St. Lucie River Watershed (**Figures 4-31 through 4-40**). Each figure's upper plot depicts the change in nutrient loading compared to a reference period adjusted for rainfall along with five-year rolling averages. The reference period selected for the trend analysis considered periods of limited implementation of source controls. The lower plot of these figures presents the comparison of the observed and predicted load. The predicted load is an estimate of the reference period nutrient load in response to a specific water year's hydrologic variability. **Figures 4-29, 4-30, and 4-41** depict annual observed composite concentrations and the five-year rolling averages for Tidal Caloosahatchee, Coastal Caloosahatchee, and St. Lucie River Watershed tidal and coastal areas not monitored for flow.

Lake Okeechobee Watershed

There were data available to develop TP loading trend analyses that consider flow and water quality data for 71 percent of the Lake Okeechobee Watershed. Rainfall runoff regressions were developed for the Boggy Creek, Shingle Creek, Lower Kissimmee, Fisheating Creek, Arbuckle Creek, Josephine Creek, Indian Prairie, S-133, S-154, S-191, L-8, C-44, East Caloosahatchee, and S-4/Industrial Canal basins. The results from the first 11 basins are presented in **Figures 4-12 through 4-22**. Note that since the C-44, East Caloosahatchee, and S-4/Industrial Canal basins overlap with the St. Lucie River Watershed and Caloosahatchee River Watershed, respectively, and primarily discharge to these watersheds, their data plots are presented under those watersheds.

WY2014 nutrient TP loading for the Boggy Creek, Shingle Creek, Arbuckle Creek, Indian Prairie, S-154 and S-191 basins are all below their reference period nutrient load adjusted for hydrologic variability. However, for the Josephine Creek, Fisheating Creek, S-133, Lower Kissimmee, and L-8 basins, the WY2014 TP nutrient loading were higher than reference period TP load adjusted for hydrologic variability. Note that the loading calculations are based on a methodology that estimates the runoff generated within each basin and excludes pass-through flows, if applicable. For example, Lake Kissimmee pass-through flows are excluded in the Lower Kissimmee calculation, Lake Istokpoga pass-through flows are excluded in the Indian Prairie calculation, and Lake Okeechobee pass-through flows are excluded in the L-8 calculation.

The remaining 29 percent of the Lake Okeechobee Watershed, which include the S-135, S-154C, Nicodemus Slough, and portions of the Upper Kissimmee Basin (not included in the Boggy Creek and Shingle Creek basins) and portions of the Lake Istokpoga Basin excluding Arbuckle Creek and Josephine Creek basins did not have sufficient data to develop statistically significant rainfall runoff regressions for a trend analysis. Data collection continues in most of these areas so that perhaps regressions can be developed in the future.

Chapter 40E-61, F.A.C., adopted in 1989 provides phosphorus concentration limitations for permittees in the Lake Okeechobee Watershed. It was expected that the concentrations could be achieved through the implementation of permitted phosphorus control plans utilizing BMPs. These concentration limitations were developed based on the Surface Water Improvement and Management (SWIM) Plan target phosphorus loading rate for Lake Okeechobee which was 360 mt per year. According to the technical support document for the rule (SFWMD, 1989b), the load contributions from rainfall, Lake Istokpoga, and Lake Kissimmee were subtracted from the target loading rate and then that load was divided by the average annual discharge from the 34 SWIM plan basins and then converted to a concentration target. It was determined that a 180-ppb annual average TP concentration at all inflows to the lake would result in the long-term average annual target load of 360 mt. The 19 SWIM basins that had concentrations below 180 ppb (based on average flow-weighted concentrations from 1973 to 1987; SFWMD, 1989a) had lake inflow concentration limitations that maintained their existing water quality. The remaining 15 SWIM basins for which the historical water quality exceeded 180 ppb had their lake inflow concentration limitation set at 180 ppb. During WY2014, S-133, S-154, S-154C, S-191, and Fisheating Creek all had TP discharge concentrations greater than 180 ppb. The Indian Prairie Sub-watershed, which is made up of multiple SWIM plan basins, also had a mean discharge concentration greater than 180 ppb.

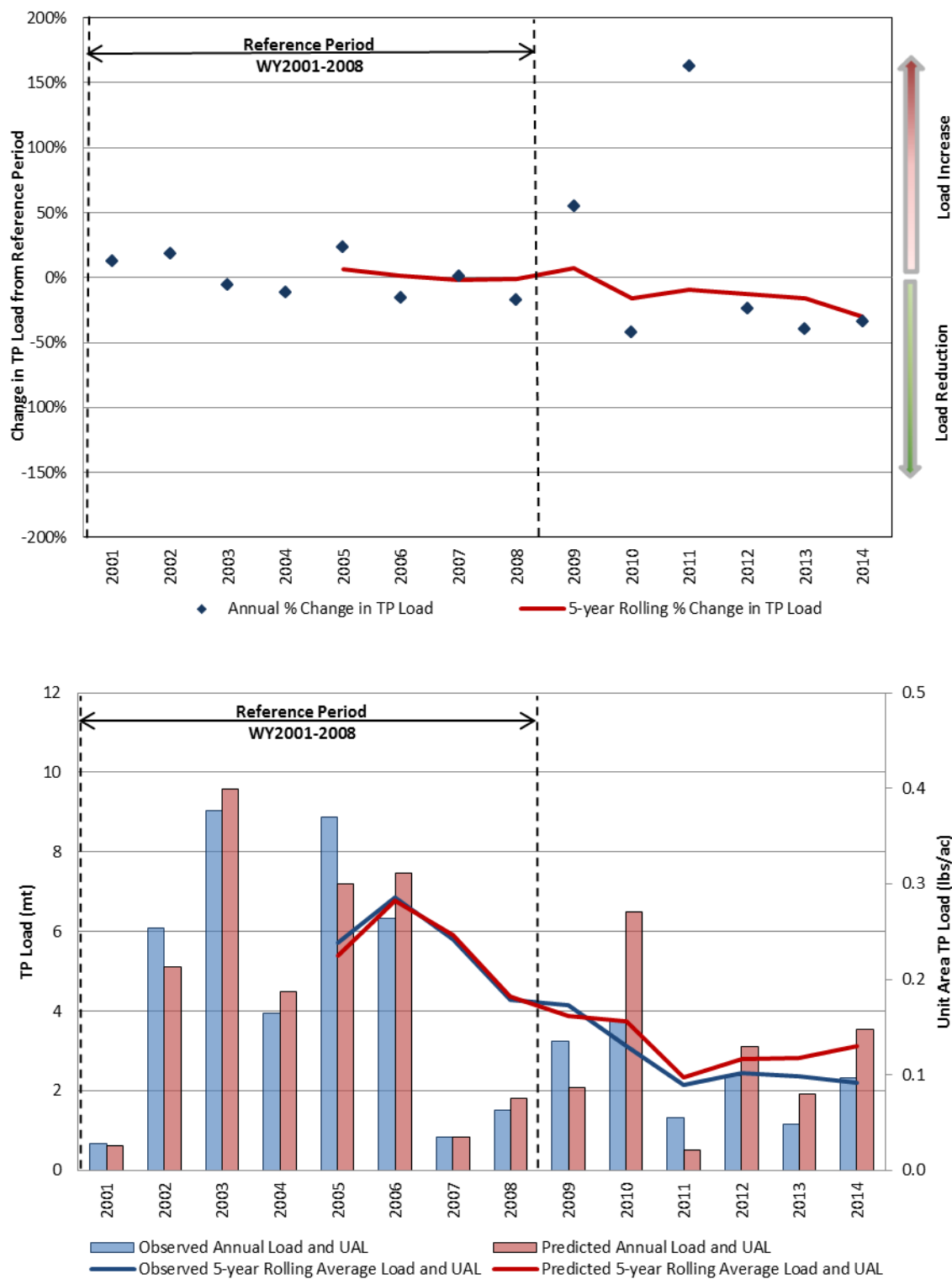


Figure 4-12. Boggy Creek: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

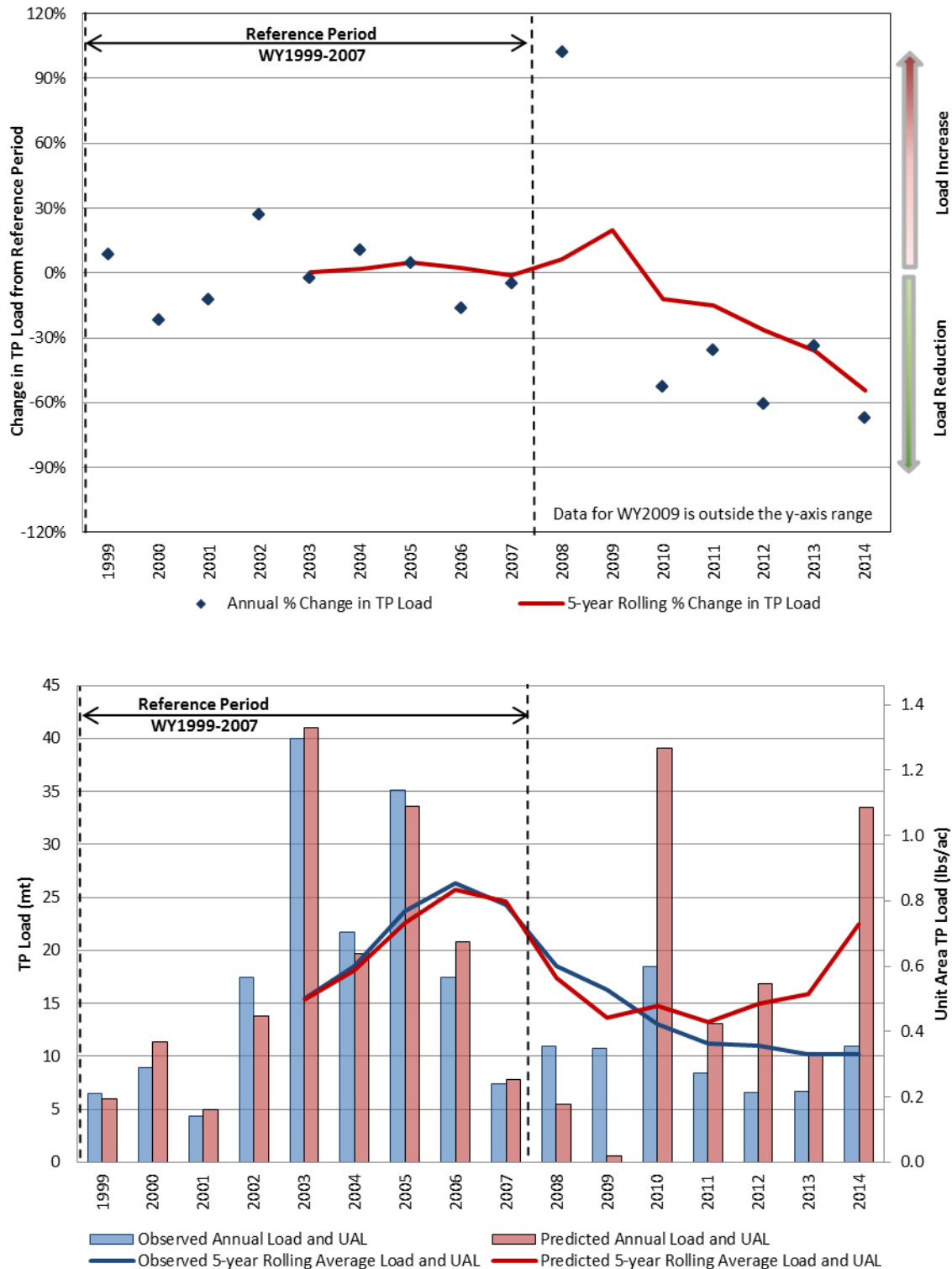


Figure 4-13. Shingle Creek: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

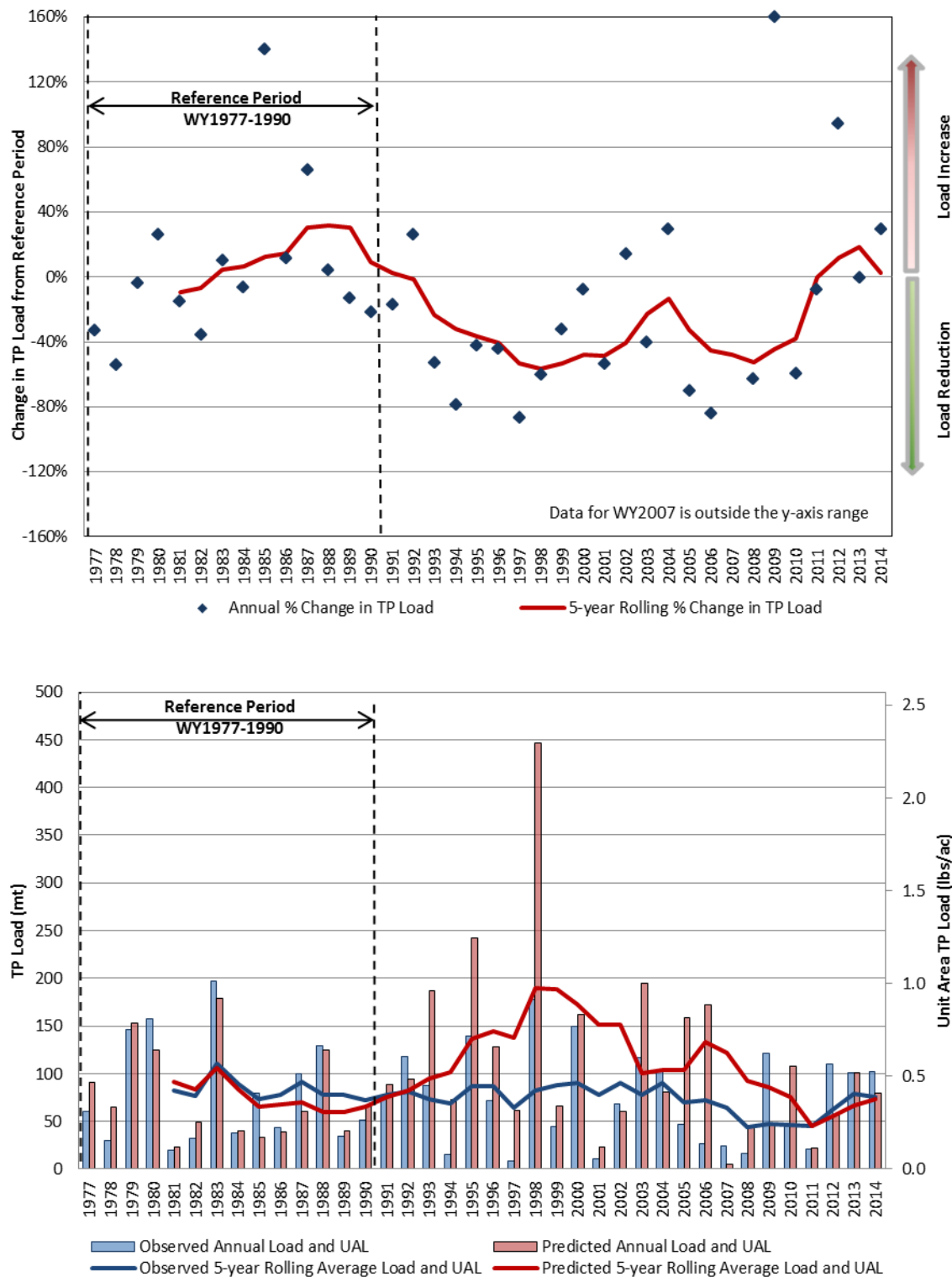


Figure 4-14. Lower Kissimmee Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

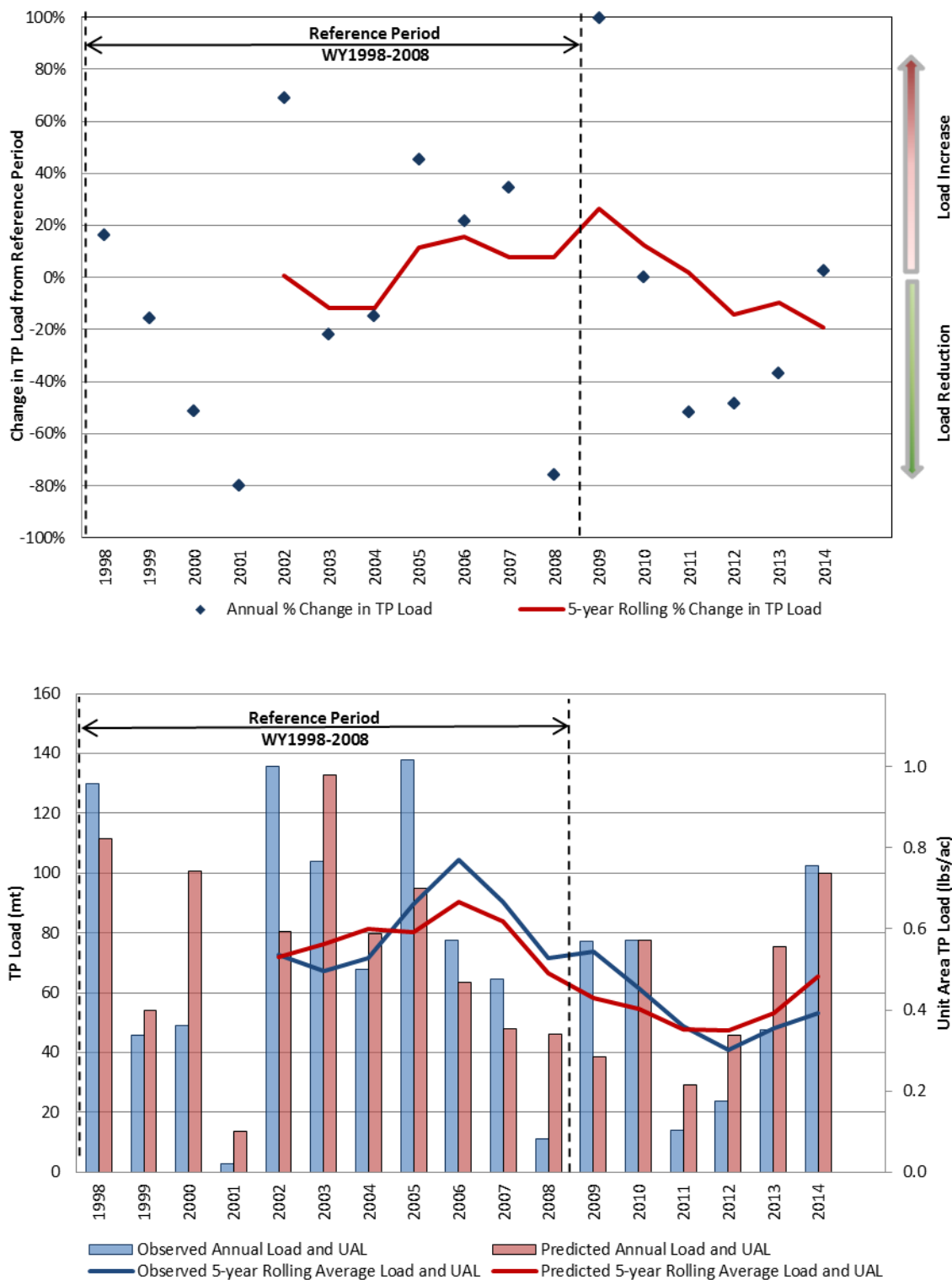


Figure 4-15. Fisheating Creek: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

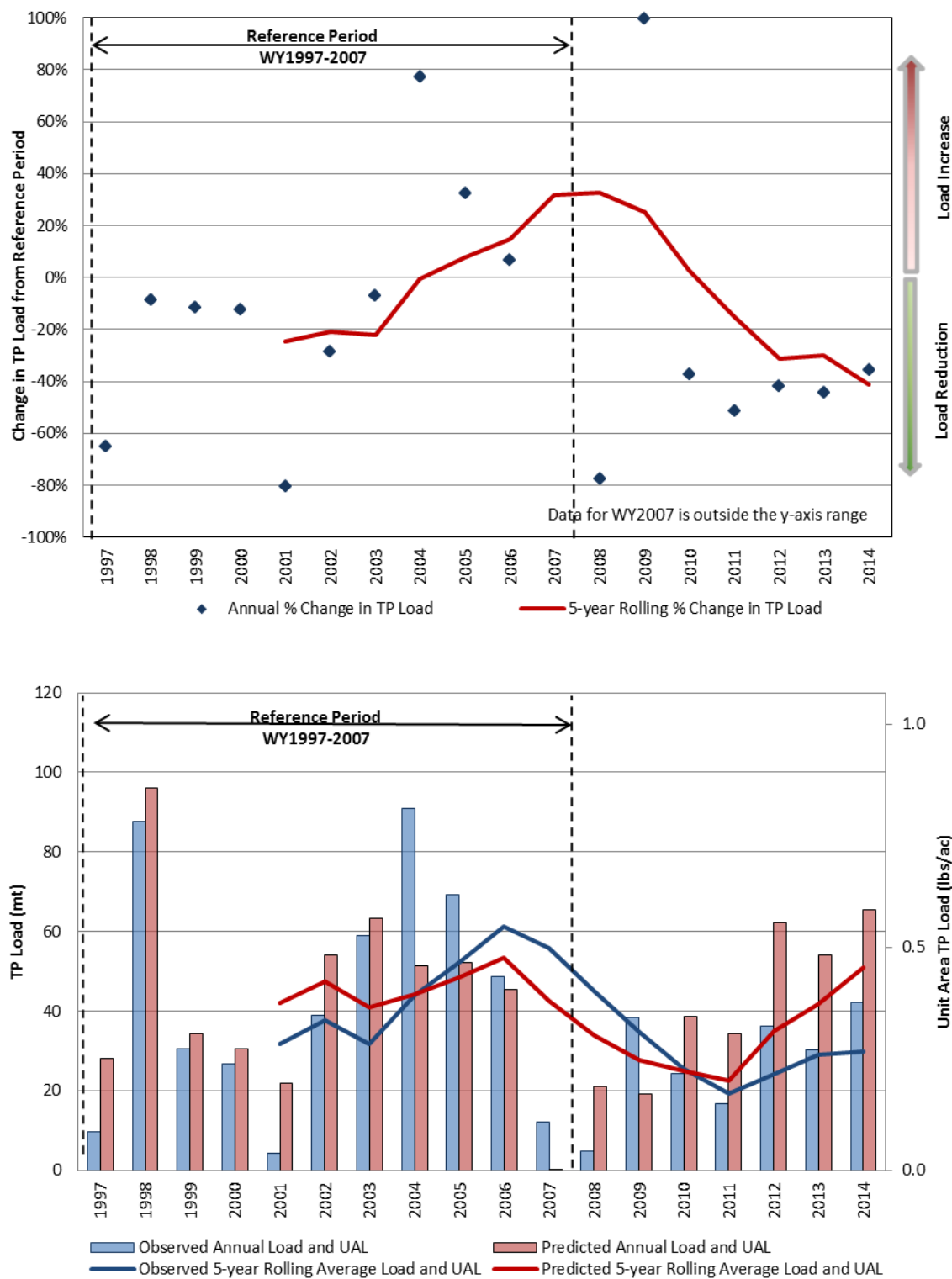


Figure 4-16. Arbuckle Creek: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

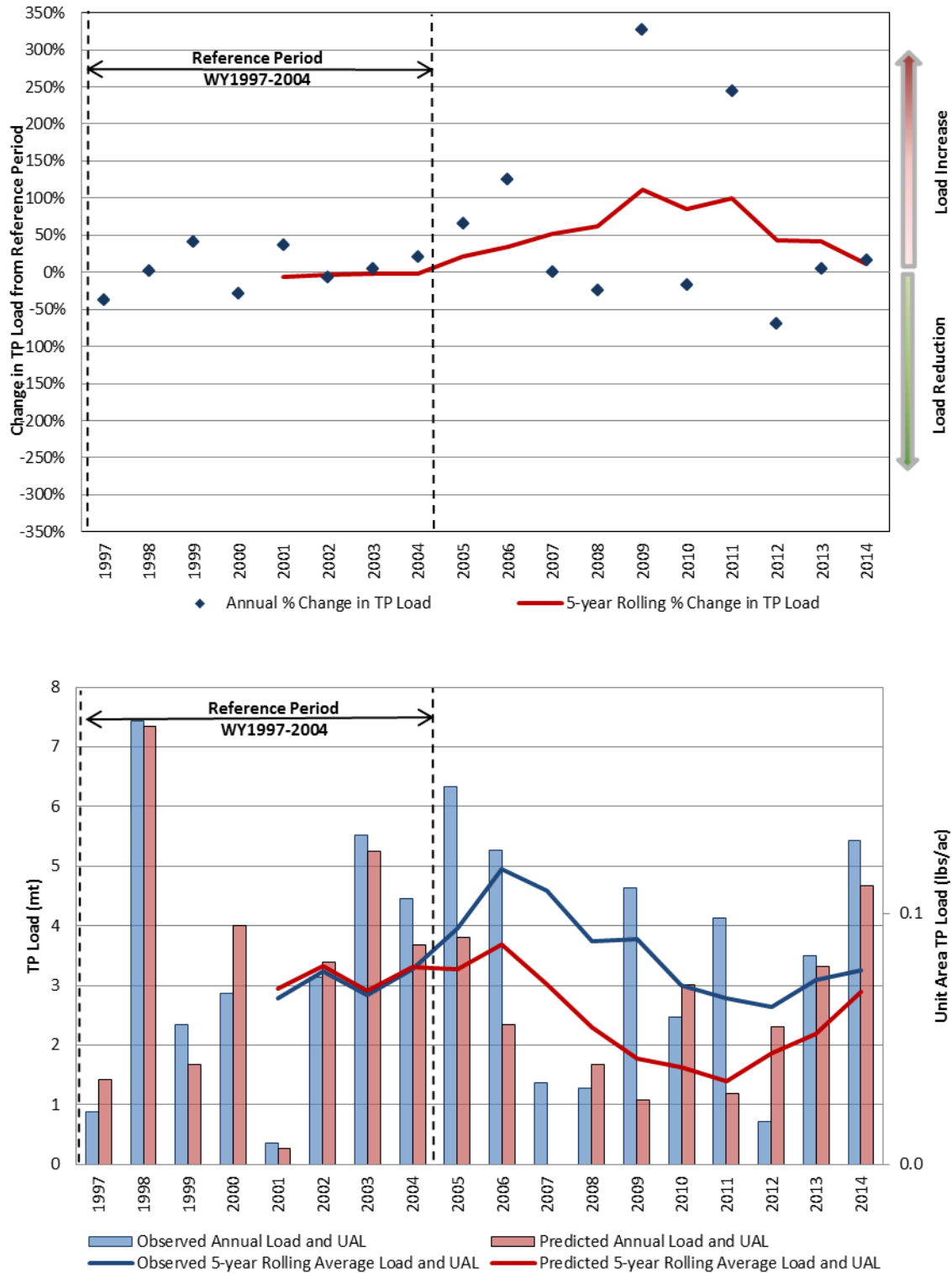


Figure 4-17. Josephine Creek: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

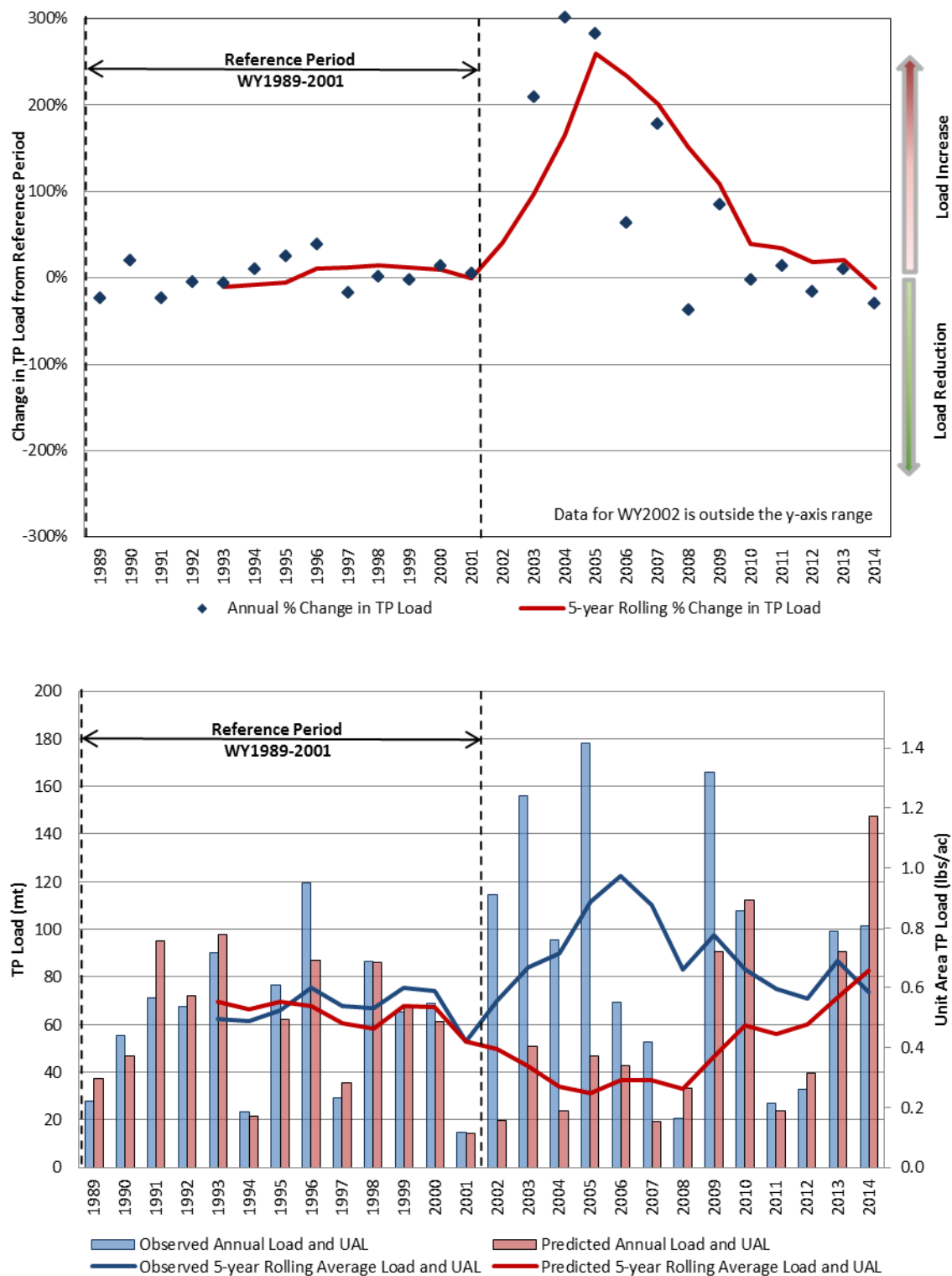


Figure 4-18. Indian Prairie Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

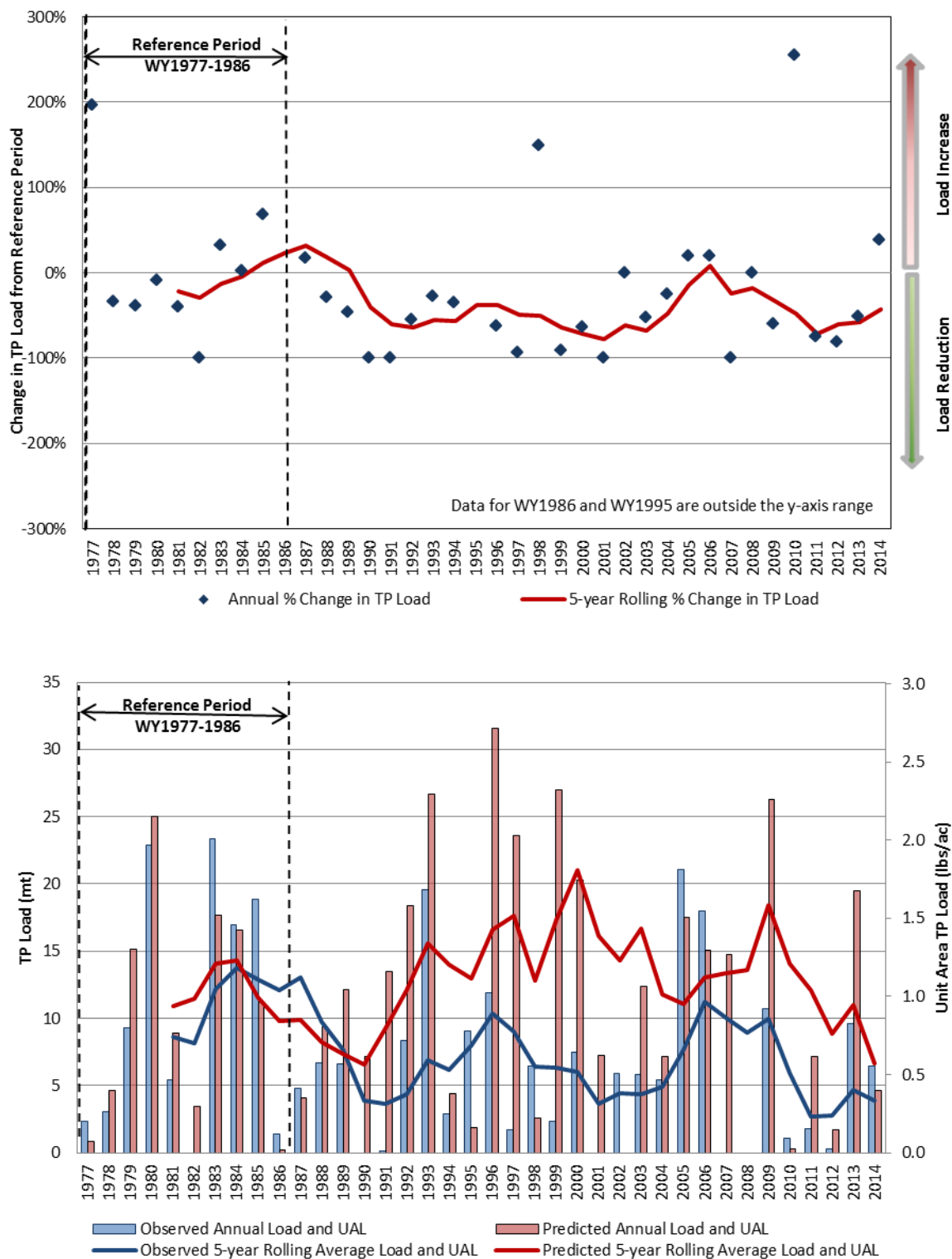


Figure 4-19. S-133 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

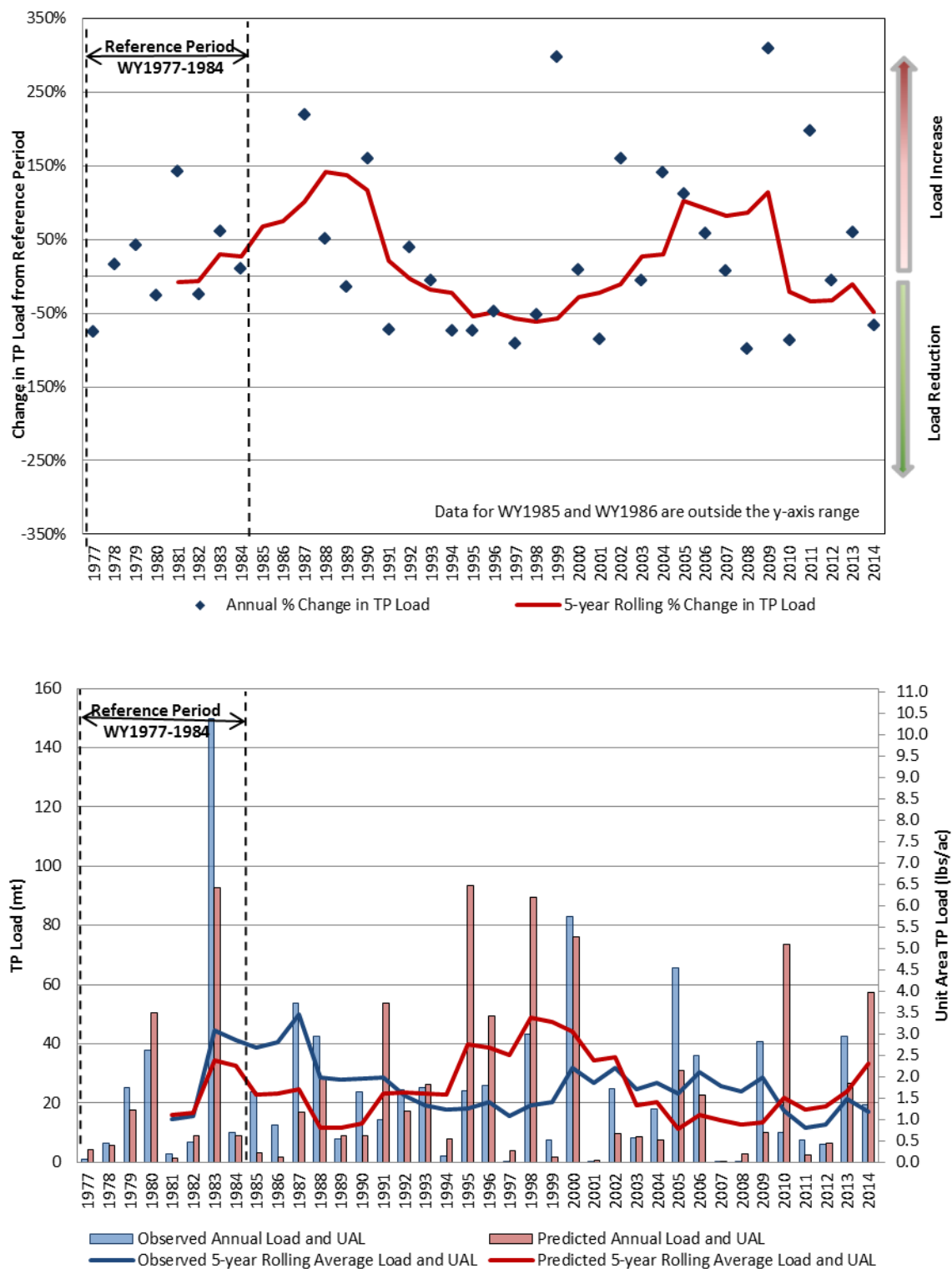


Figure 4-20. S-154 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

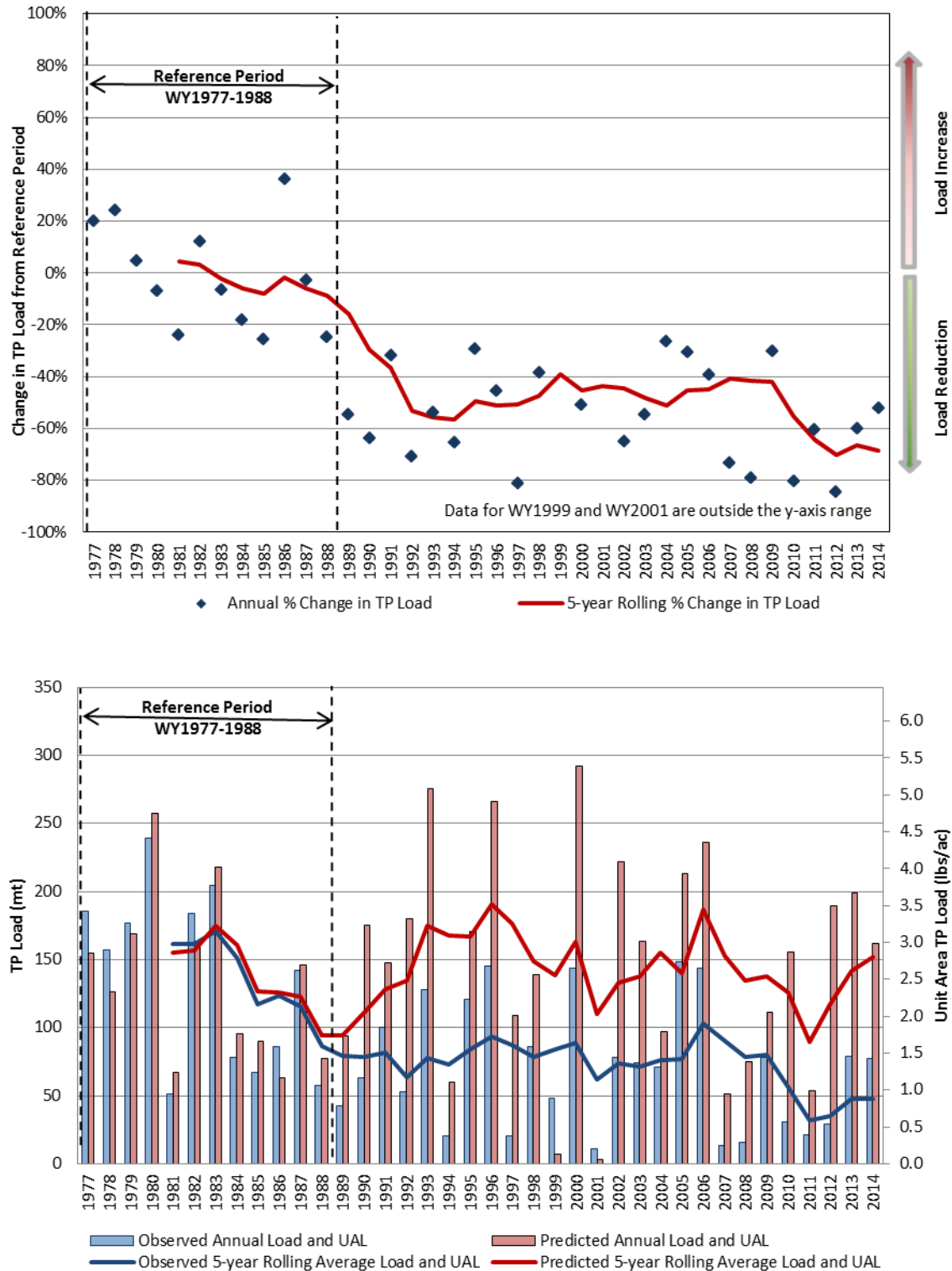


Figure 4-21. S-191 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

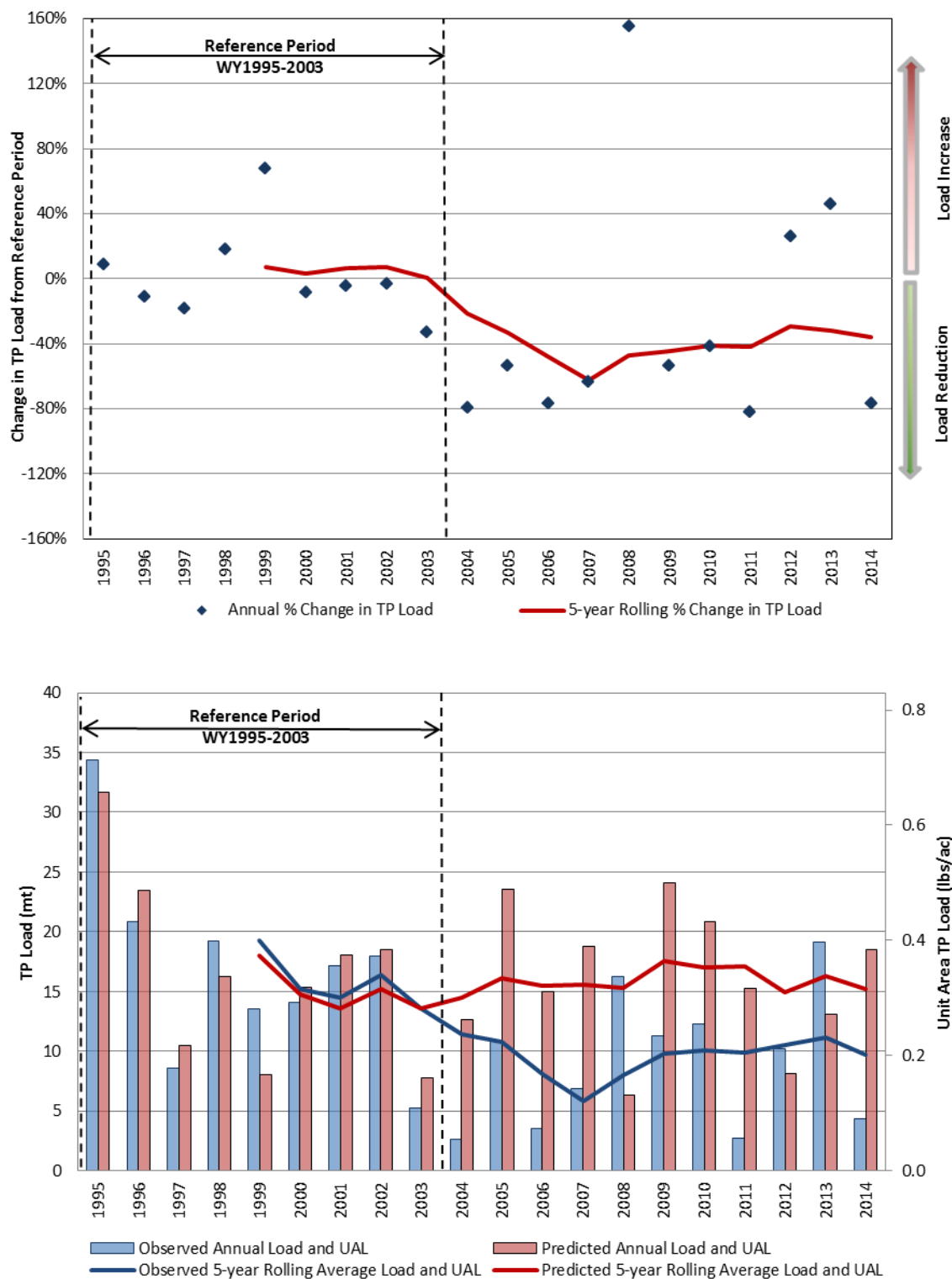


Figure 4-22. L-8 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

Caloosahatchee River Watershed

The Caloosahatchee River Watershed source control program monitoring network provides water quality and flow data to estimate nutrient loading for the S-4/Industrial Canal, East Caloosahatchee, and West Caloosahatchee basins, which represent approximately 55 percent of the Caloosahatchee River Watershed. The remaining 45 percent of the Caloosahatchee River Watershed, which includes the Tidal Caloosahatchee and Coastal Caloosahatchee basins, are represented by water quality data monitored by local entities at 18 tributary stations in the Tidal Caloosahatchee Basin and 4 tributary stations in the Coastal Caloosahatchee Basin.

WY2014 TP and TN nutrient loading for the eastern sub-watersheds (S-4/Industrial Canal, East, and West) were above their reference period nutrient loads adjusted for hydrologic variability, except for the TN load in the S-4/Industrial Canal basin, which was maintained in comparison to the reference period load (**Figures 4-23 through 4-28**). Note that the loading calculation is based on a methodology that estimates the runoff generated within the basin and excludes pass-through flows from Lake Okeechobee or other upstream areas. TN concentrations in the Tidal and Coastal sub-watersheds are above the median concentrations of the reference period while the TP concentrations are below (Tidal) or slightly above (Coastal) the median of the reference period (**Figures 4-29 and 4-30**).

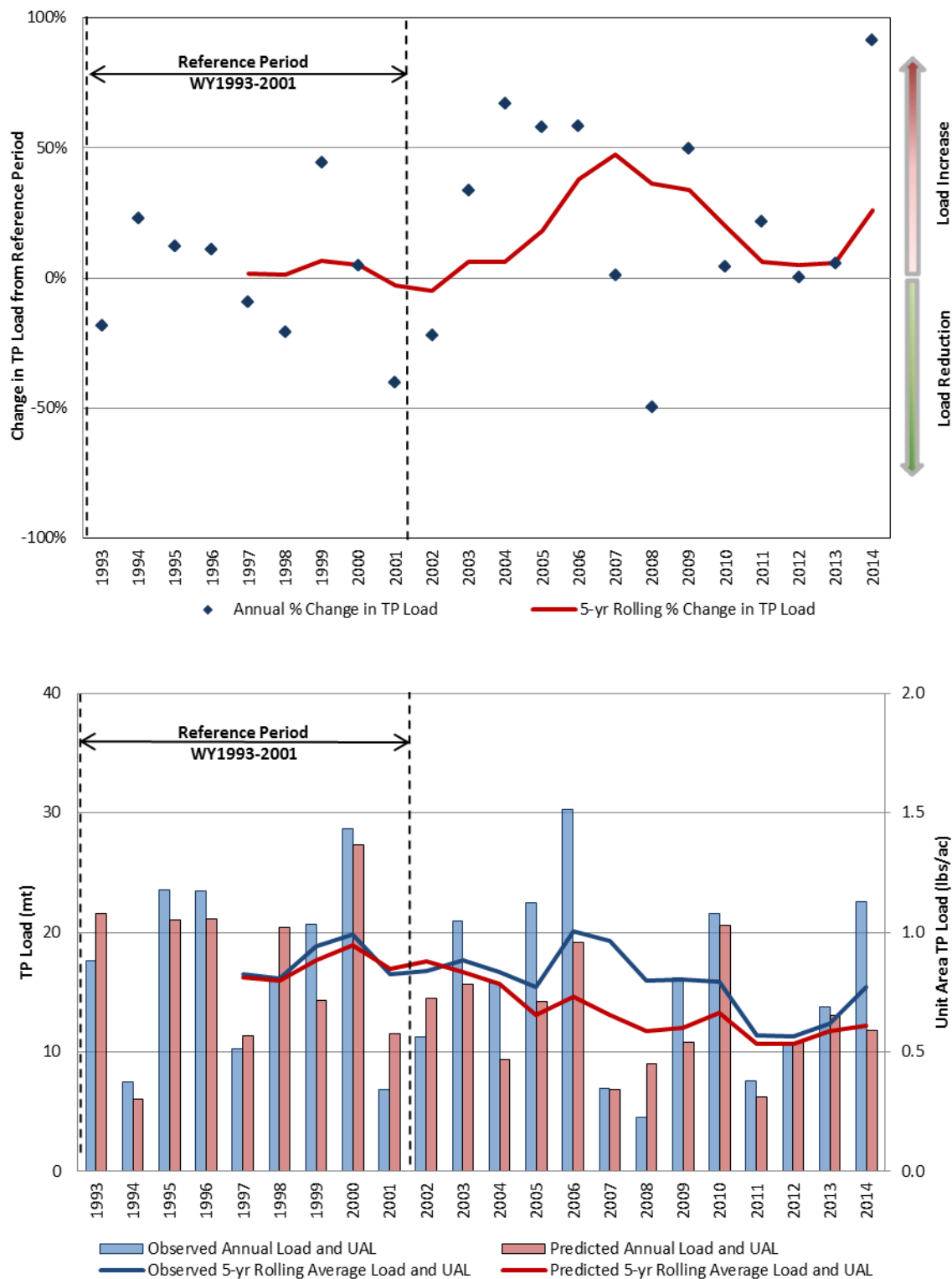


Figure 4-23. S-4 – Industrial Canal Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

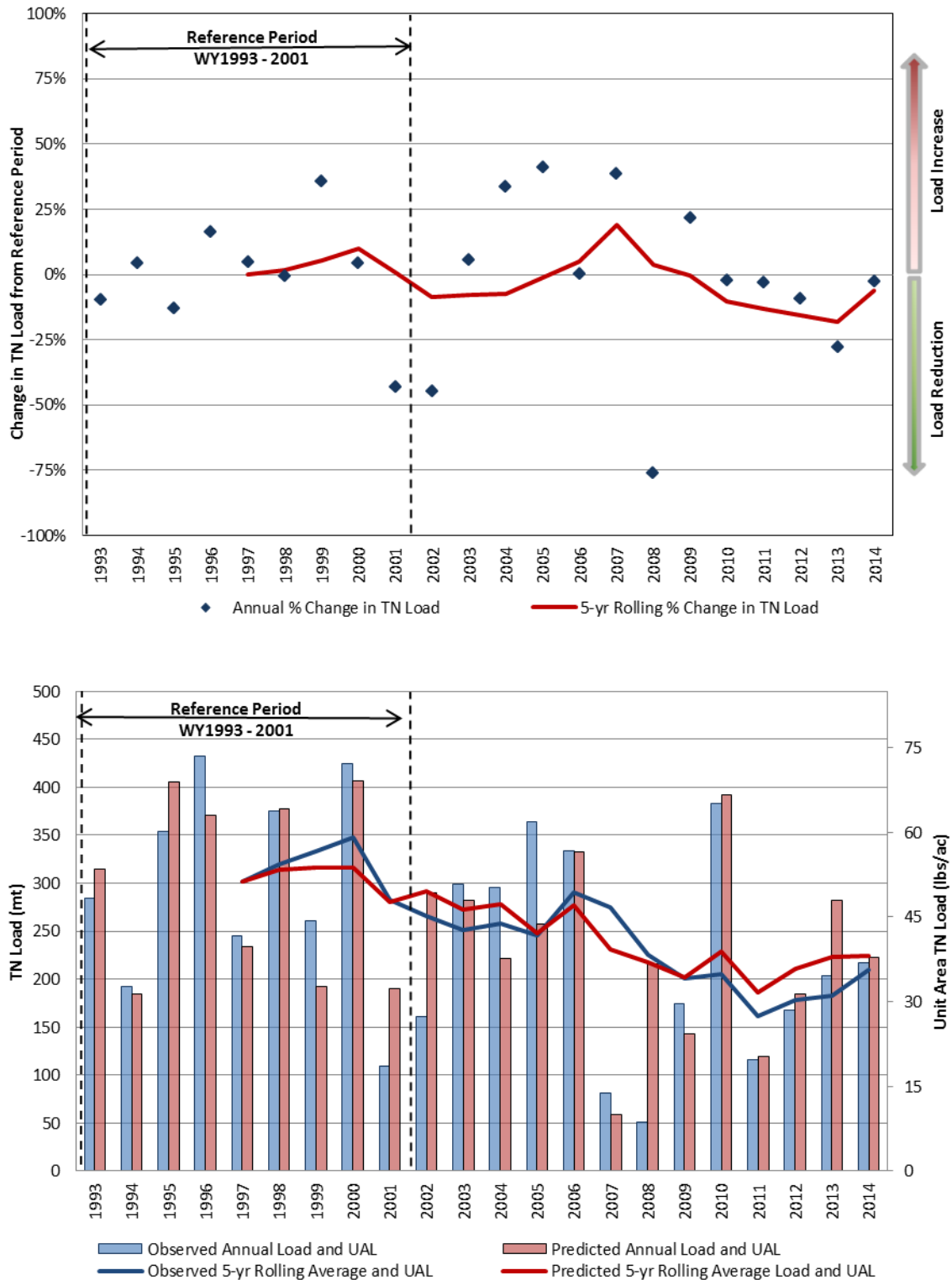


Figure 4-24. S-4 - Industrial Canal Basin: Upper plot – annual percentage change in total nitrogen (TN) load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

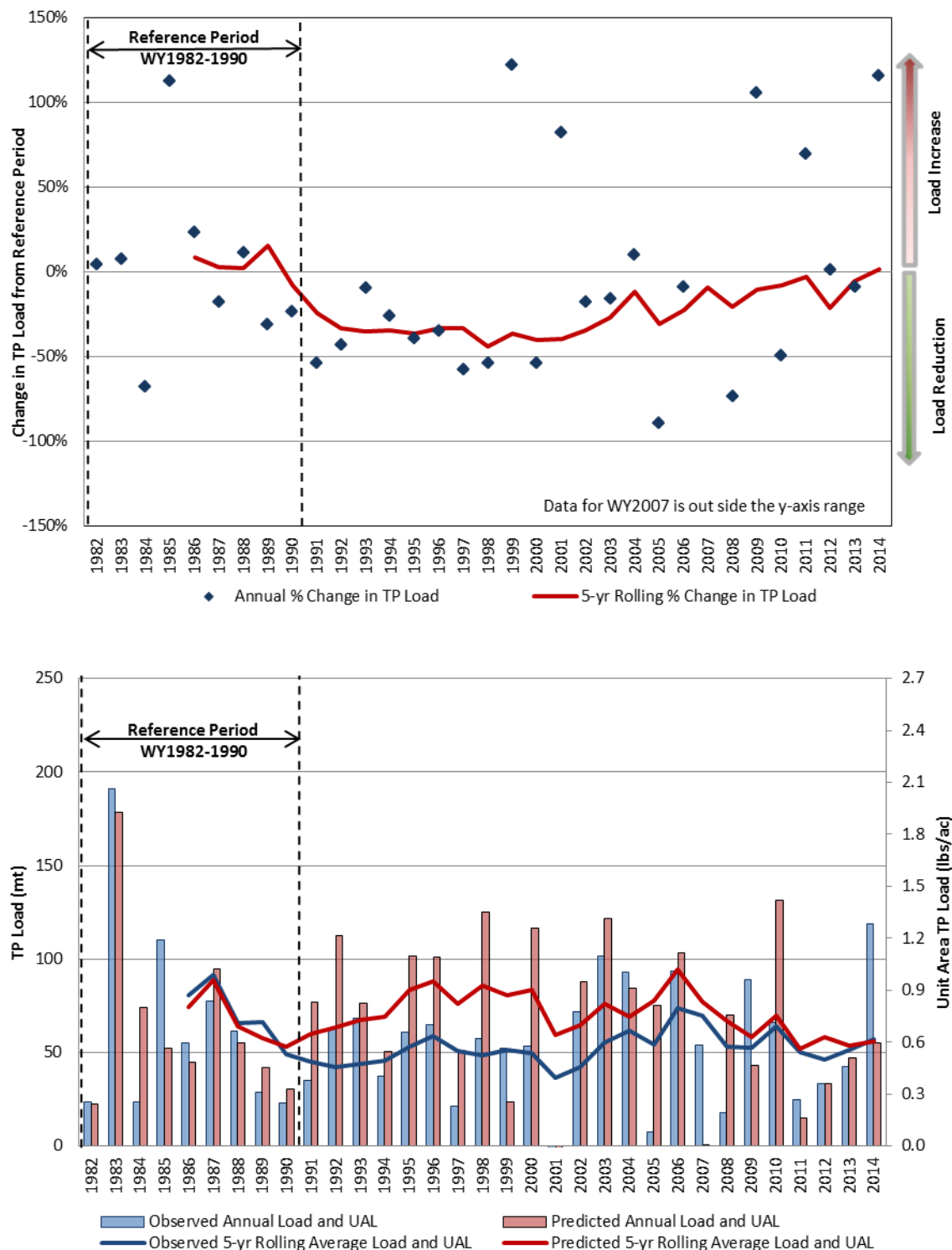


Figure 4-25. East Caloosahatchee Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages. [Note: A negative load (stored) was observed during WY2001.]

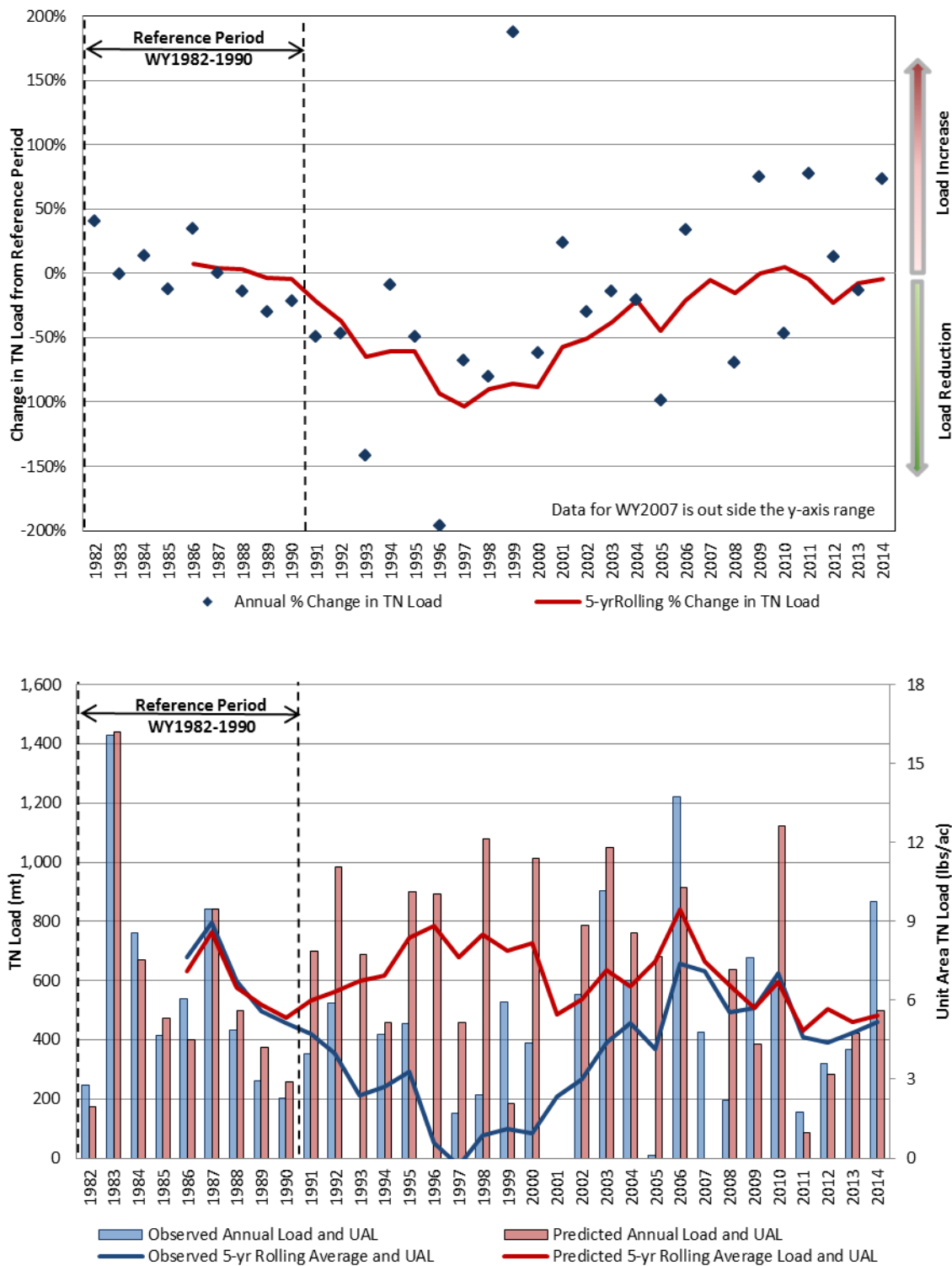


Figure 4-26. East Caloosahatchee Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages. [Note: A negative load (stored) was observed during WY1993, WY1996, and WY2001.]

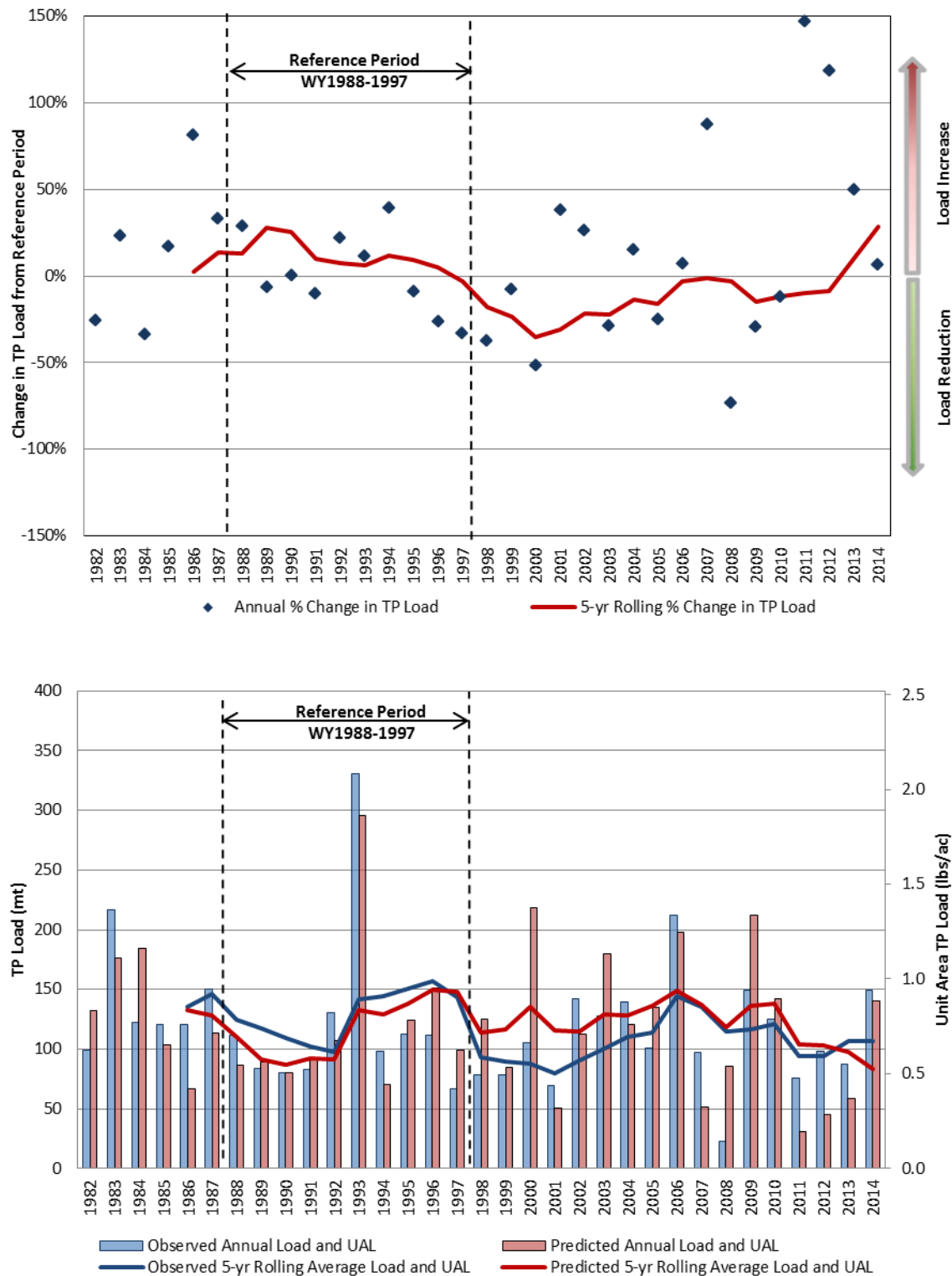


Figure 4-27. West Caloosahatchee Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

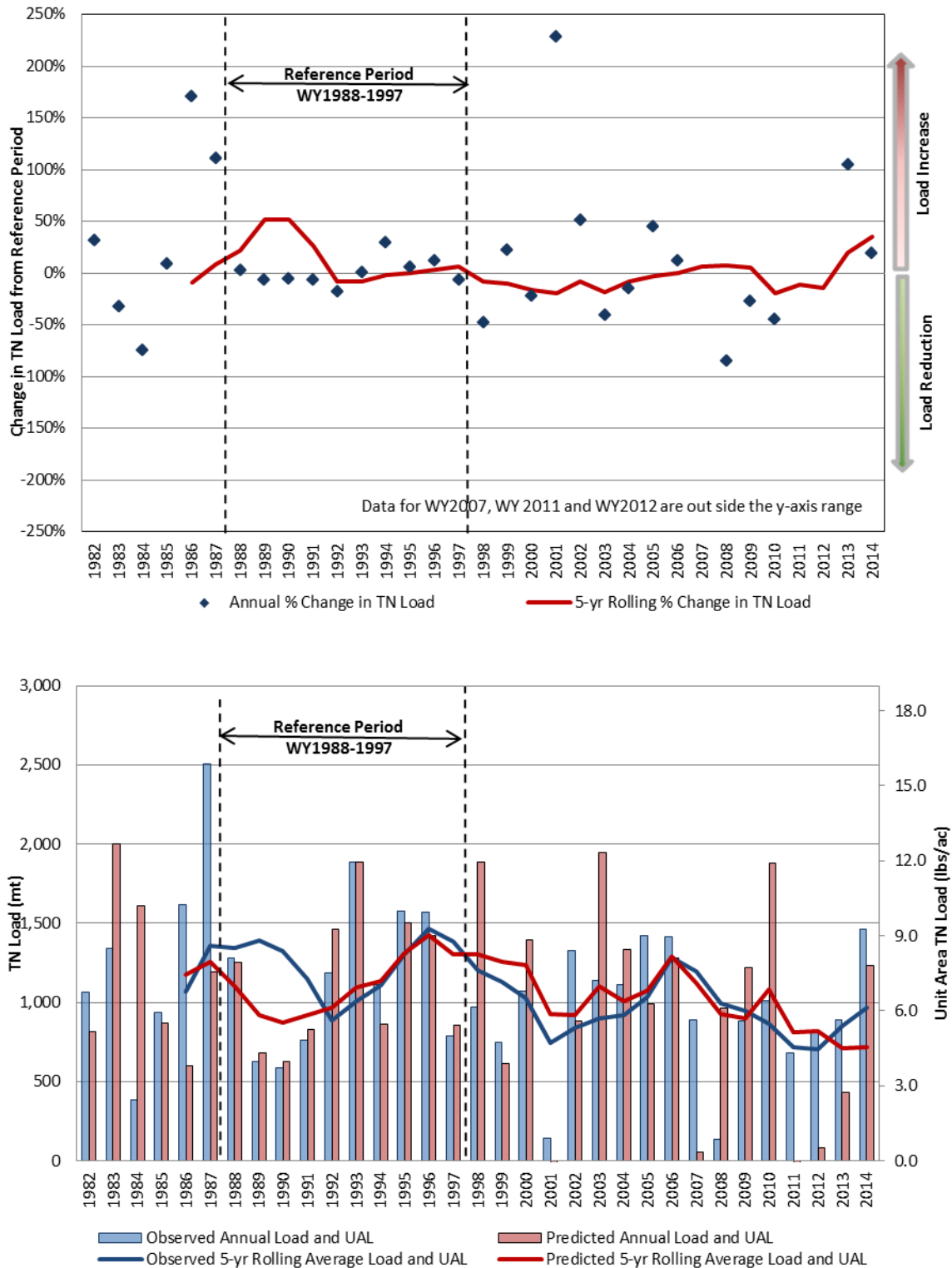


Figure 4-28. West Caloosahatchee Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

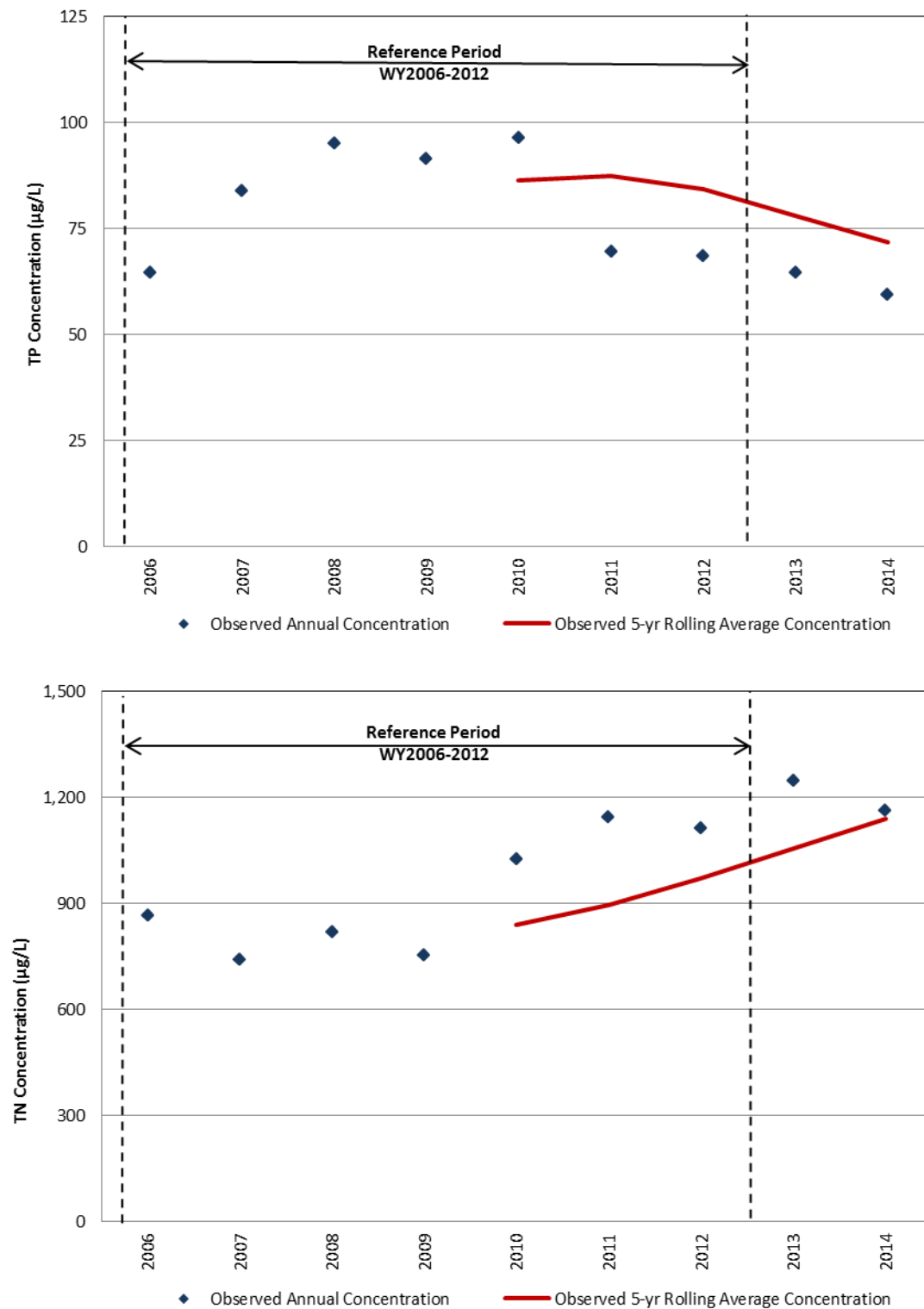


Figure 4-29. Tidal Caloosahatchee Basin: Upper plot –TP observed annual concentration and five-year rolling averages. Lower plot – TN observed annual concentration and five-year rolling averages.

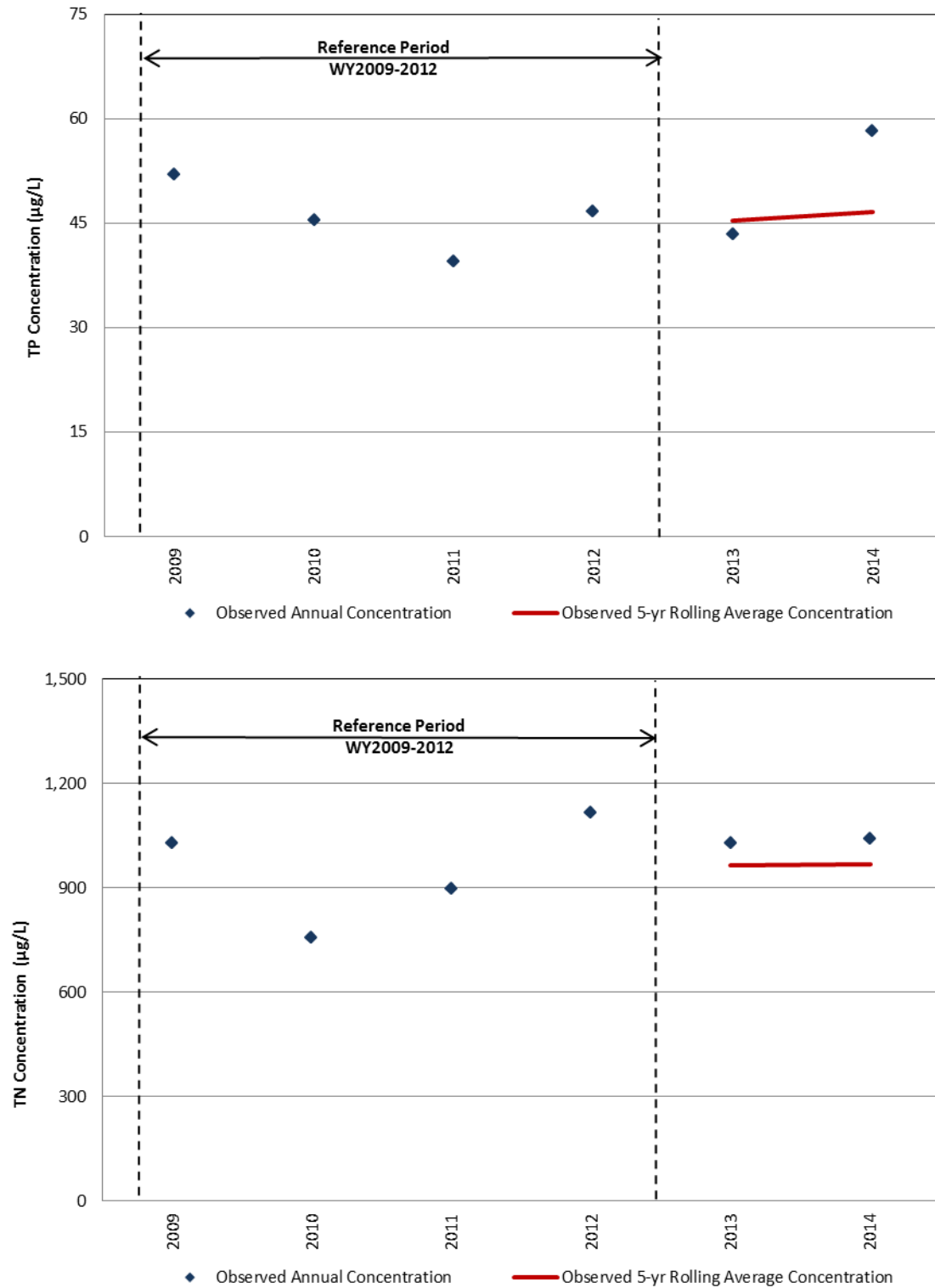


Figure 4-30. Coastal Caloosahatchee Basin: Upper plot –TP observed annual concentration and five-year rolling averages. Lower plot – TN observed annual concentration and five-year rolling averages.

St. Lucie River Watershed

The St. Lucie River Watershed source control program monitoring network provides water quality and flow data to estimate nutrient loading for the C-23, C-24, C-44, C-25 and Ten Mile Creek basins within the North Fork basin, which represent approximately 73 percent of the St. Lucie River Watershed (**Figures 4-31 through 4-40**). The remaining 27 percent of the St. Lucie River Watershed is tidal and coastal and not monitored for flow. These remaining portions of the North Fork, South Fork, North Mid-Estuary, South Mid-Estuary, Basin 4-5-6, and South Coastal basins, are referred to herein as the composite area, and are represented by water quality data monitored at 29 tributary stations (**Figure 4-41**). Twelve of these 29 tributary stations were added in May 2013.

WY2014 TP and TN nutrient loading for the C-23, C-24, and Ten Mile Creek basins are below their reference period nutrient load adjusted for hydrologic variability. However, for the C-25 and C-44 basins, the WY2014 TP and TN nutrient loading are above the reference period nutrient load adjusted for hydrologic variability. Note that the C-44 loading calculation is based on a methodology that estimates the runoff generated within the basin and excludes Lake Okeechobee pass-through flows. For the composite area, the TP concentration data is below the median of the reference period, however for TN, the concentration data is above the median of the reference period.

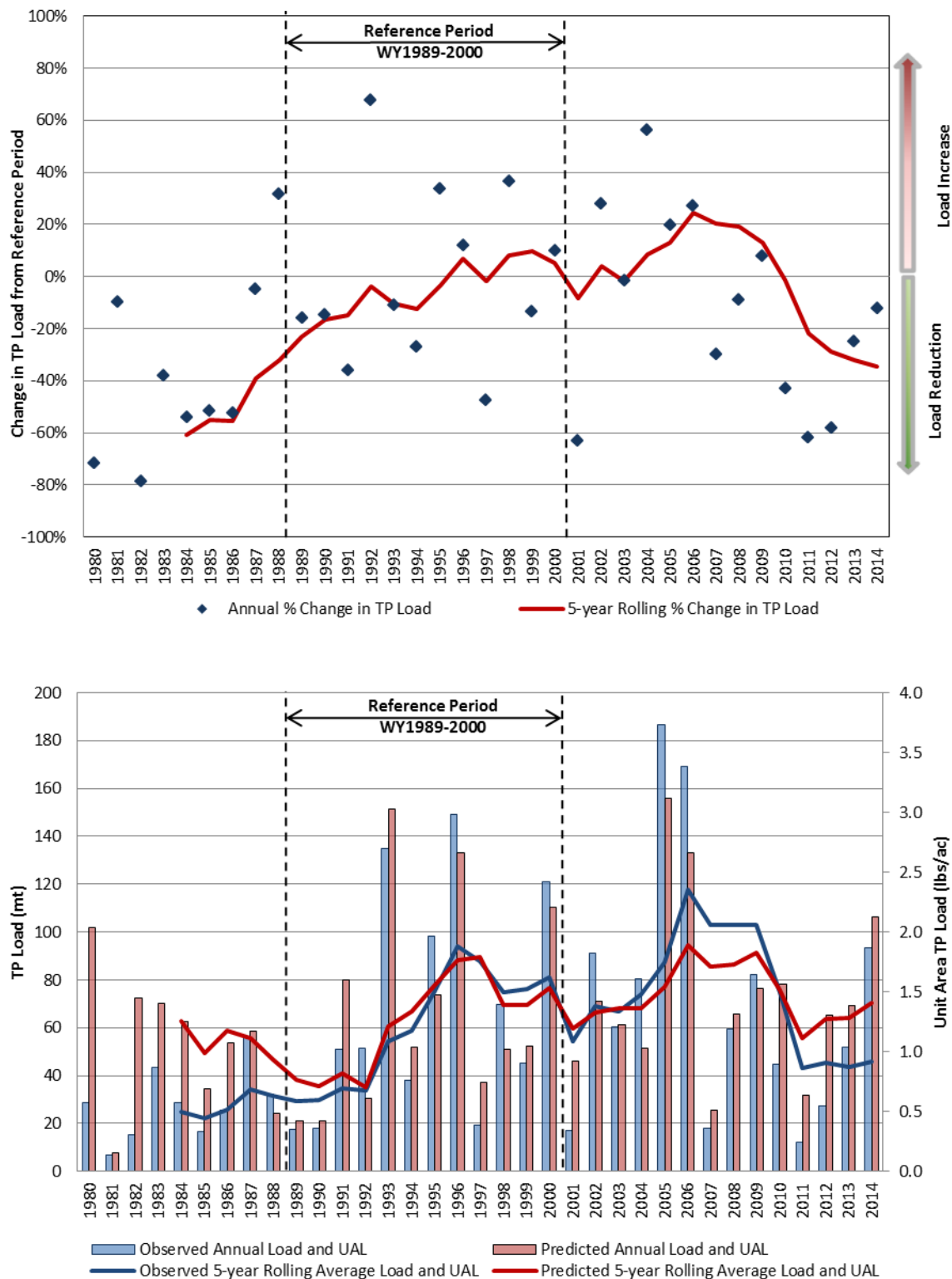


Figure 4-31. C-23 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

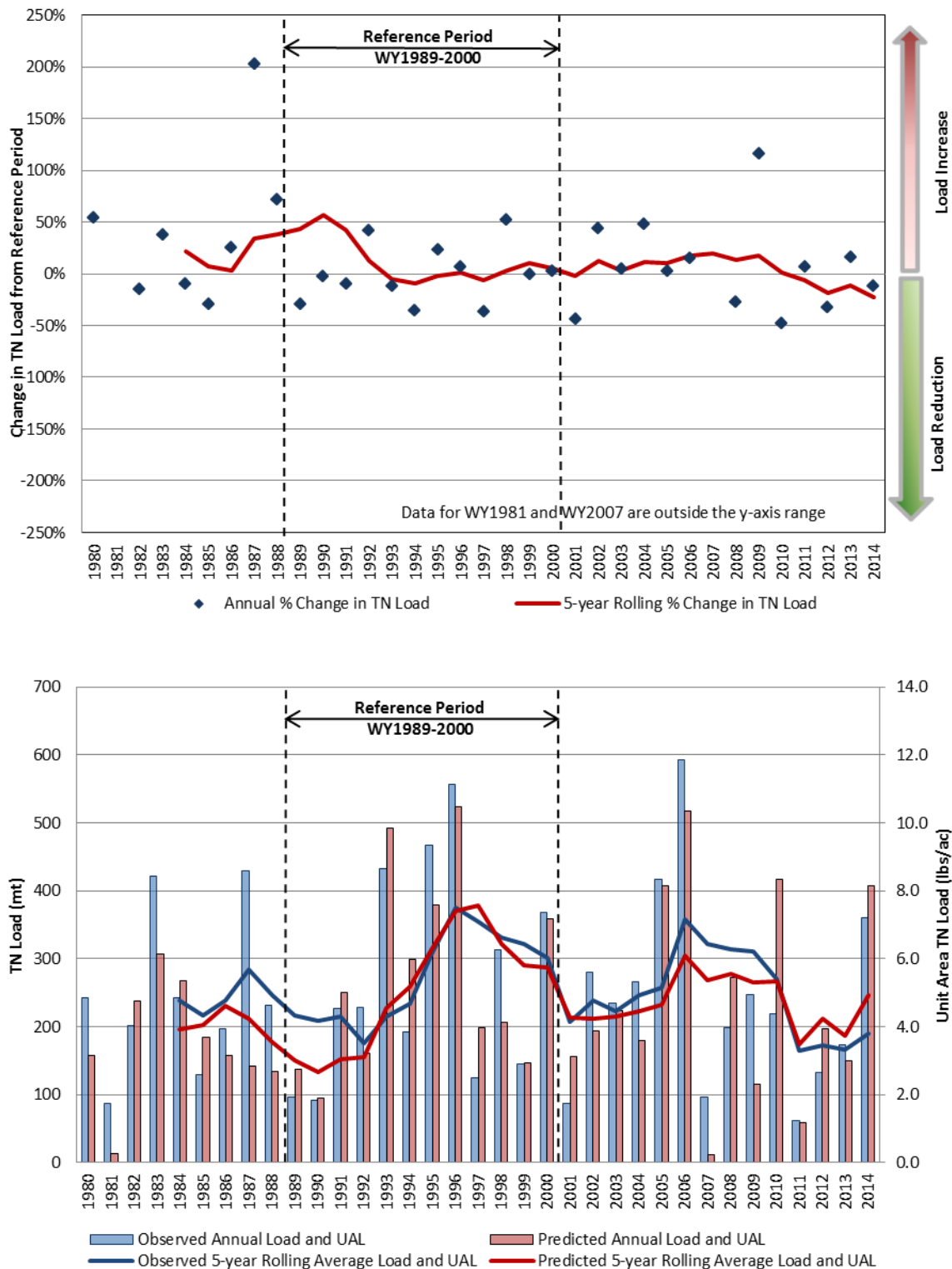


Figure 4-32. C-23 Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

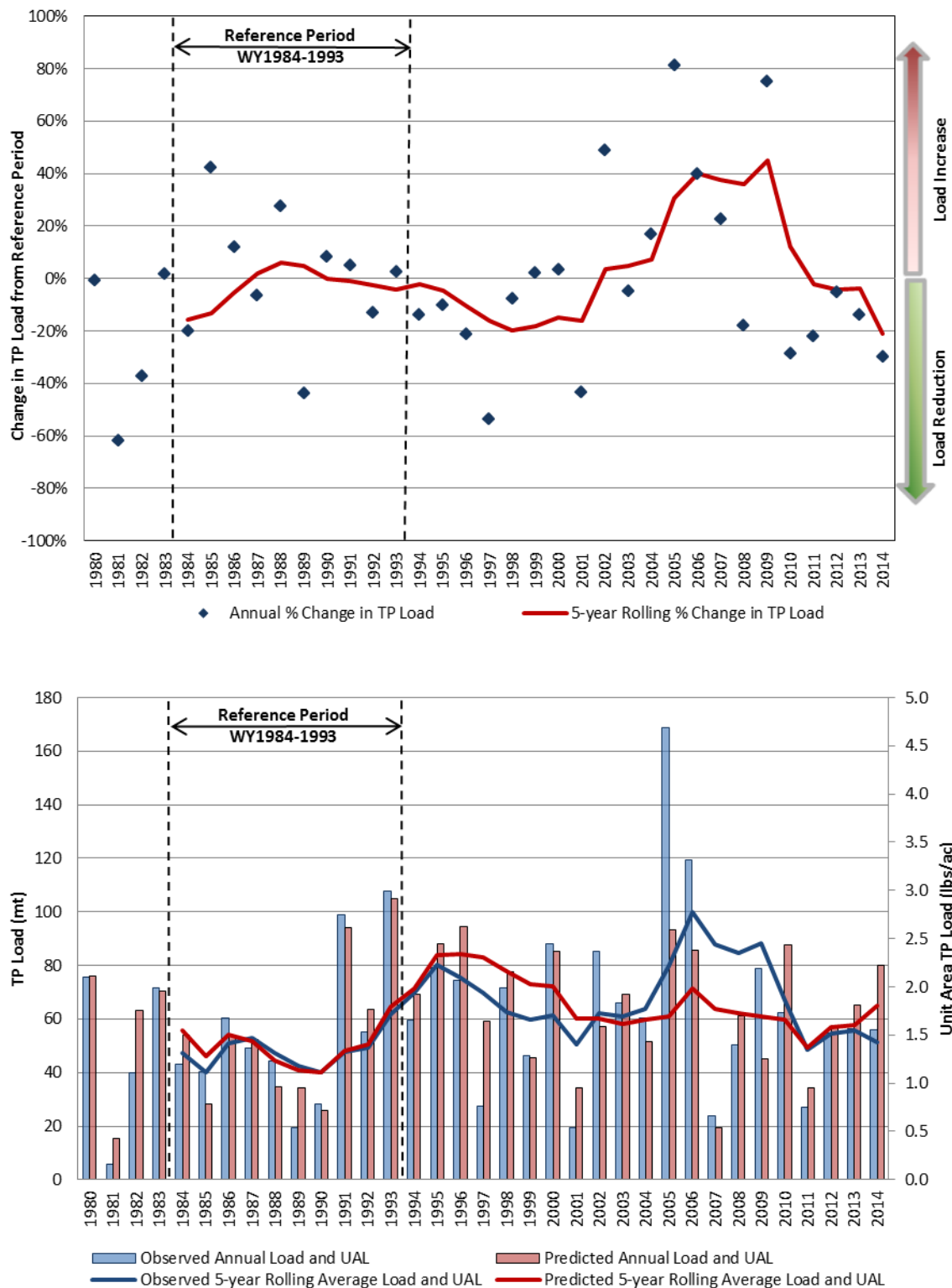


Figure 4-33. C-24 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

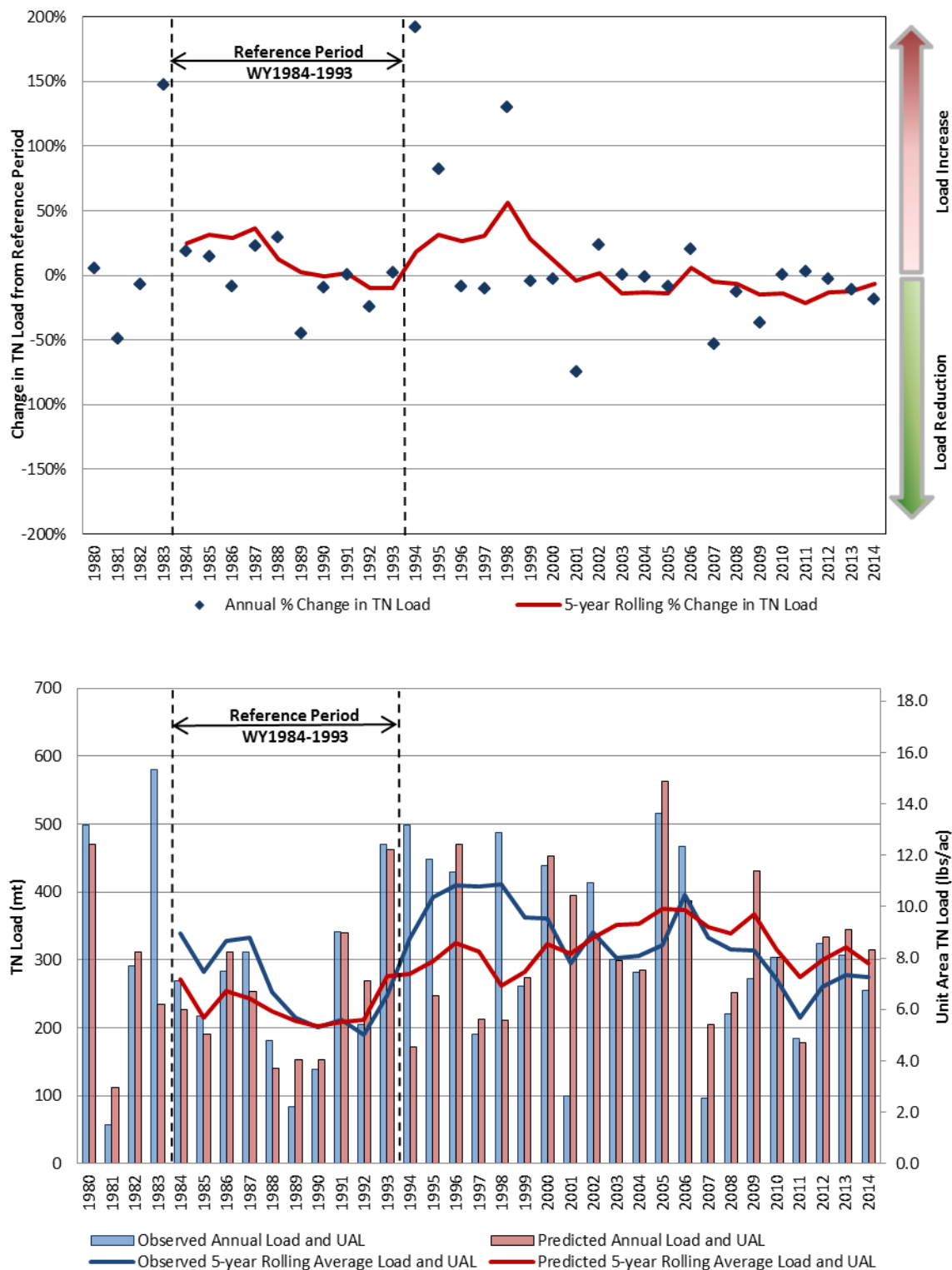


Figure 4-34. C-24 Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

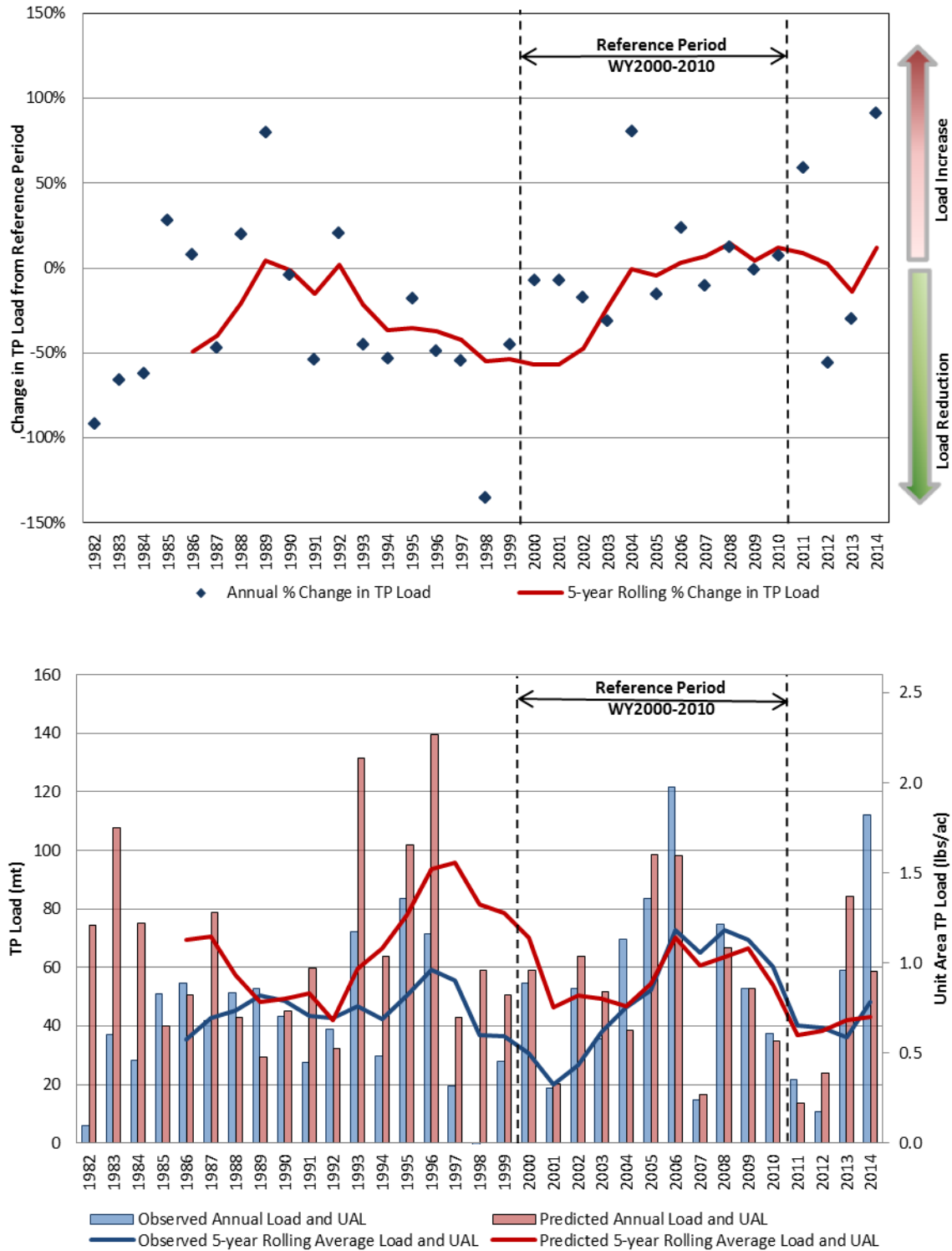


Figure 4-35. C-44 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

[Note: A negative load (stored) was observed during WY1998.]

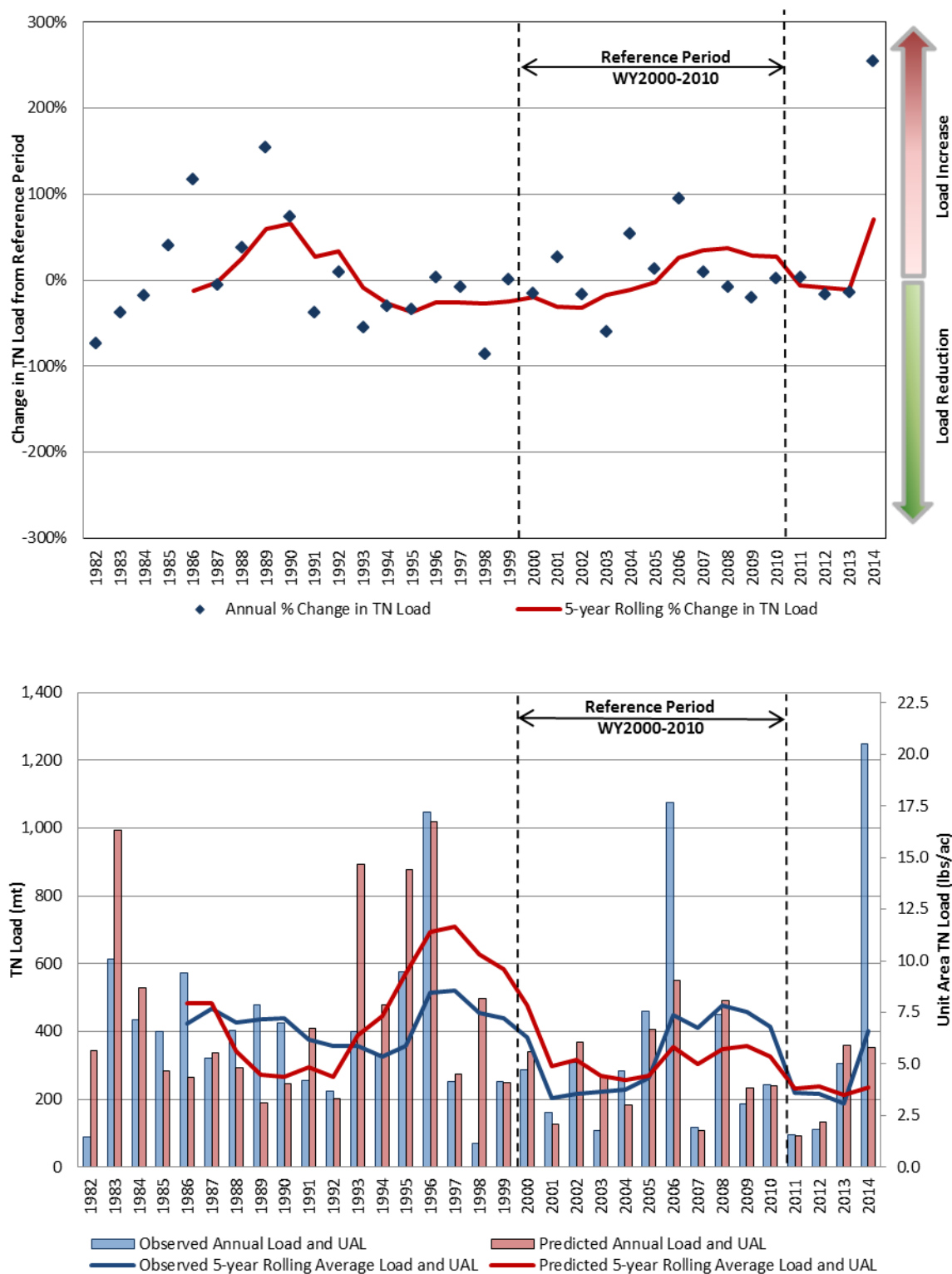


Figure 4-36. C-44 Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

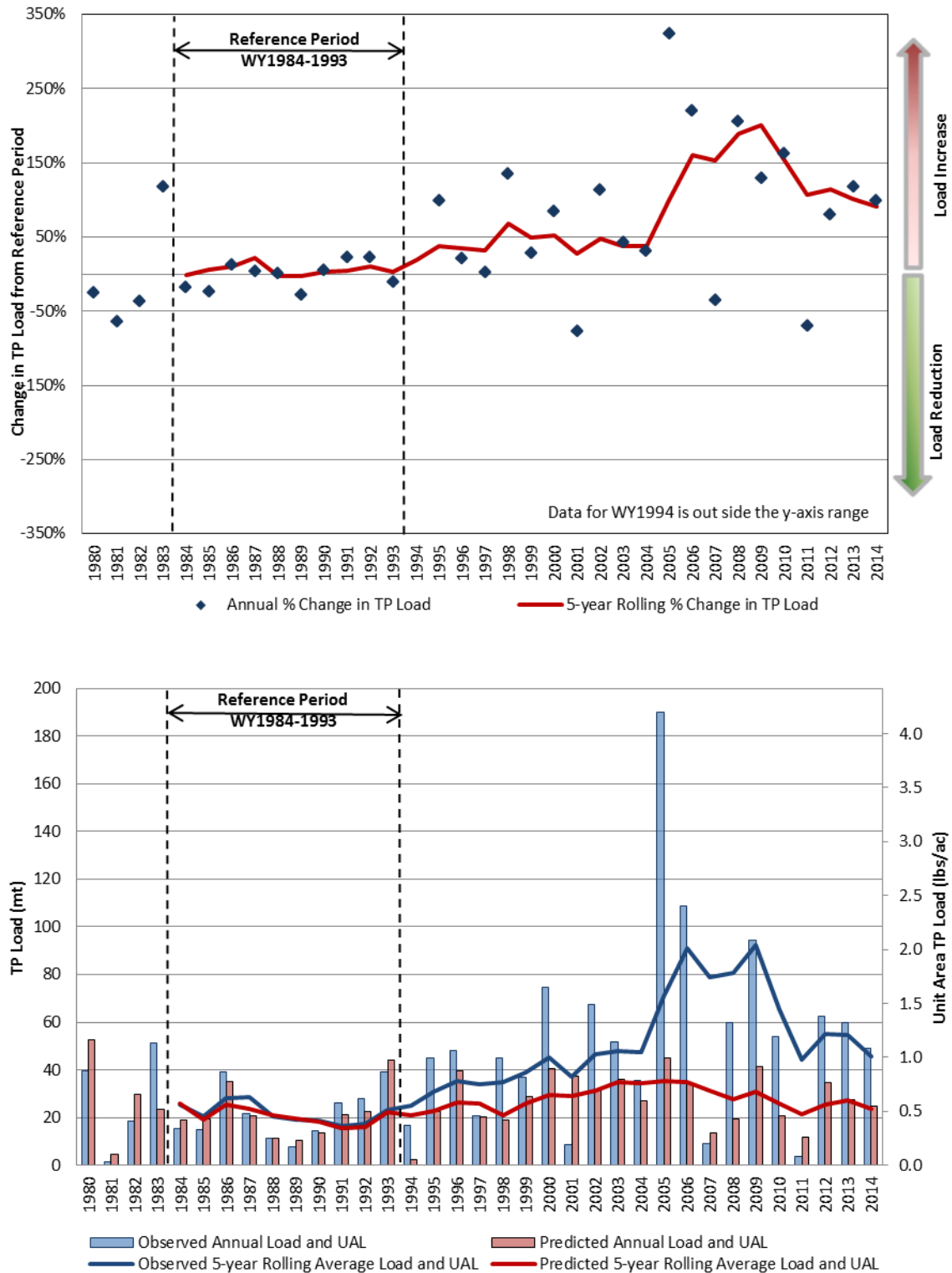


Figure 4-37. C-25 Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

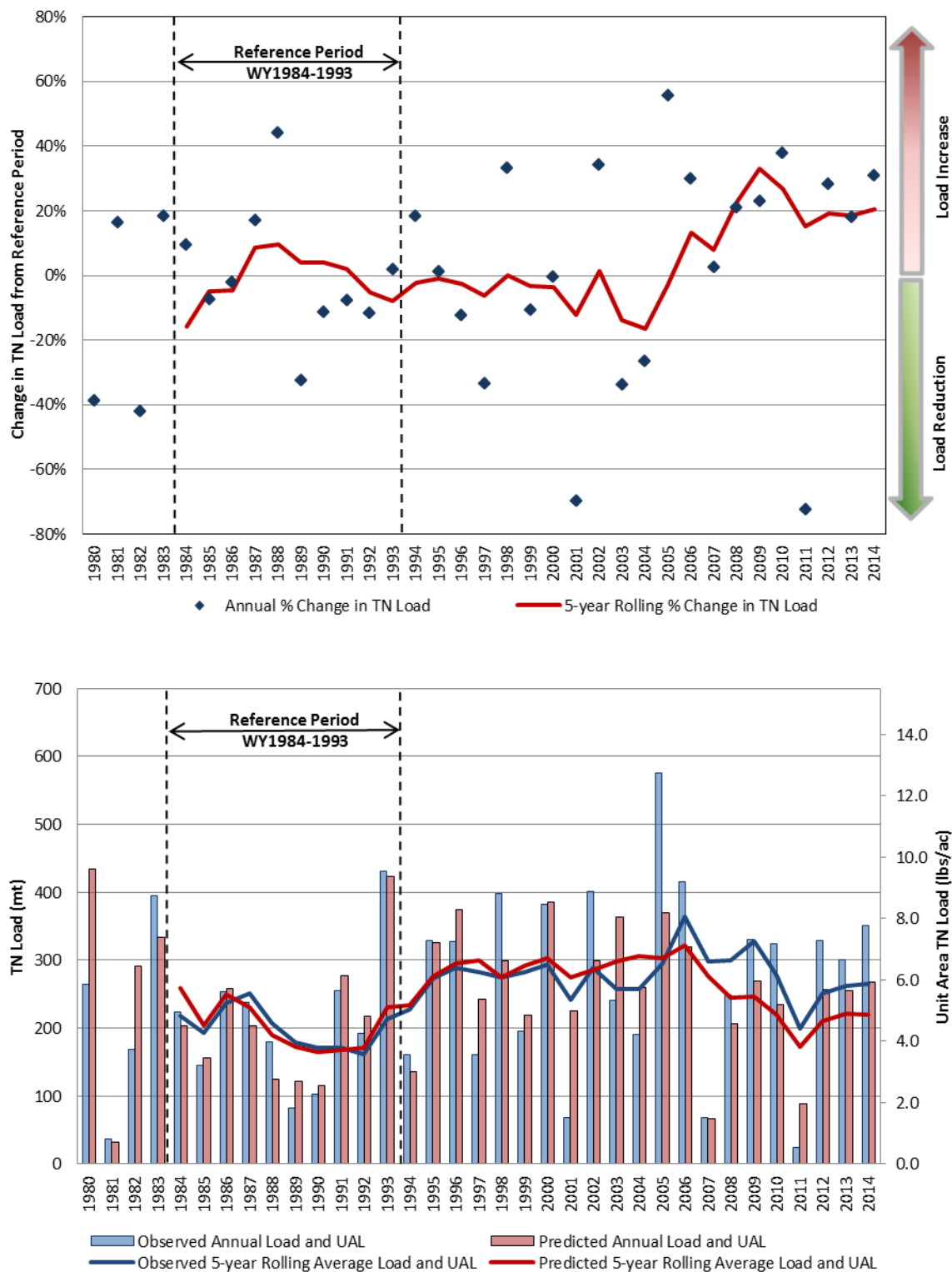


Figure 4-38. C-25 Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

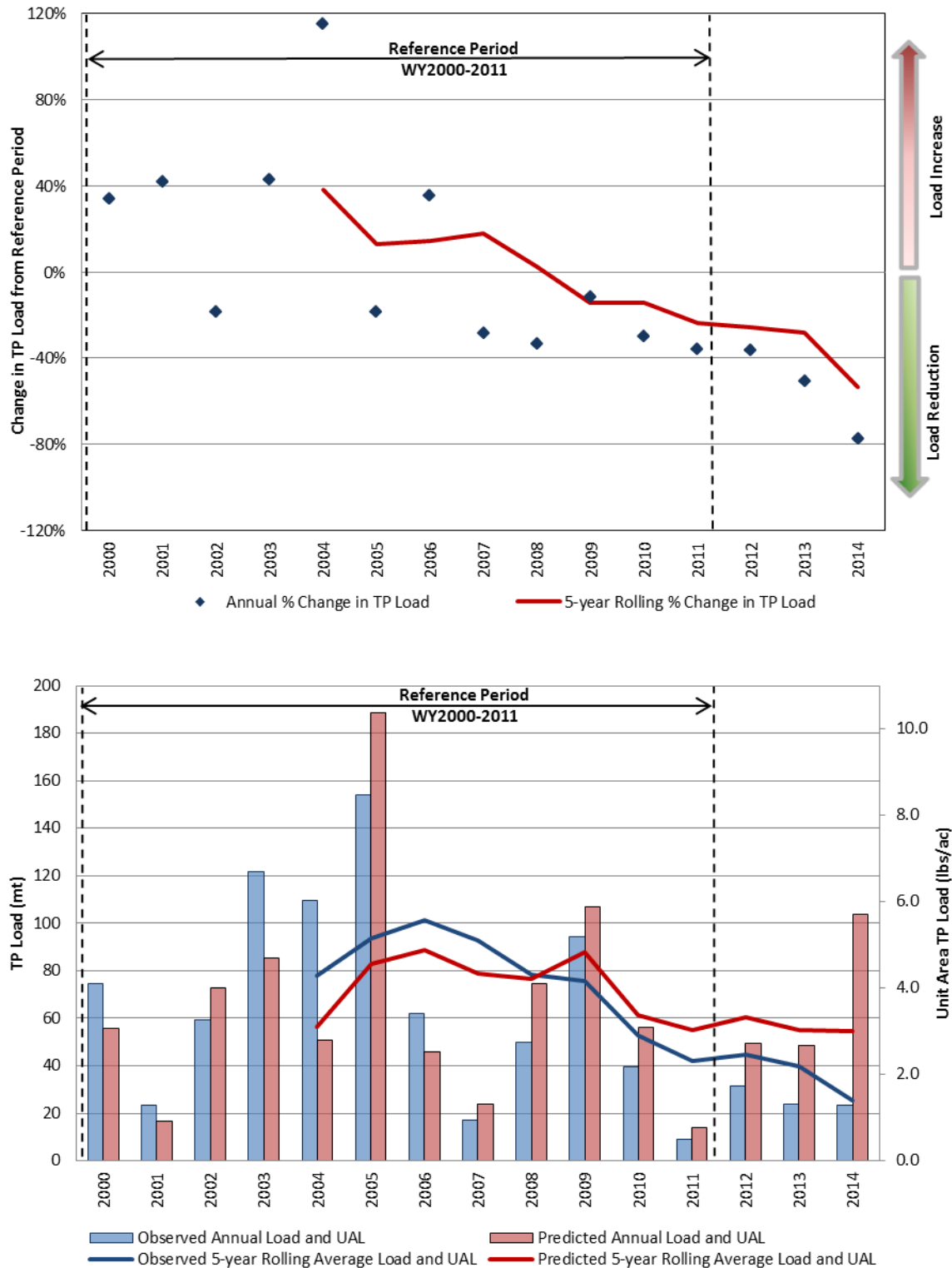


Figure 4-39. Ten Mile Creek Basin: Upper plot – annual percentage change in TP load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TP load and UAL and five-year rolling averages.

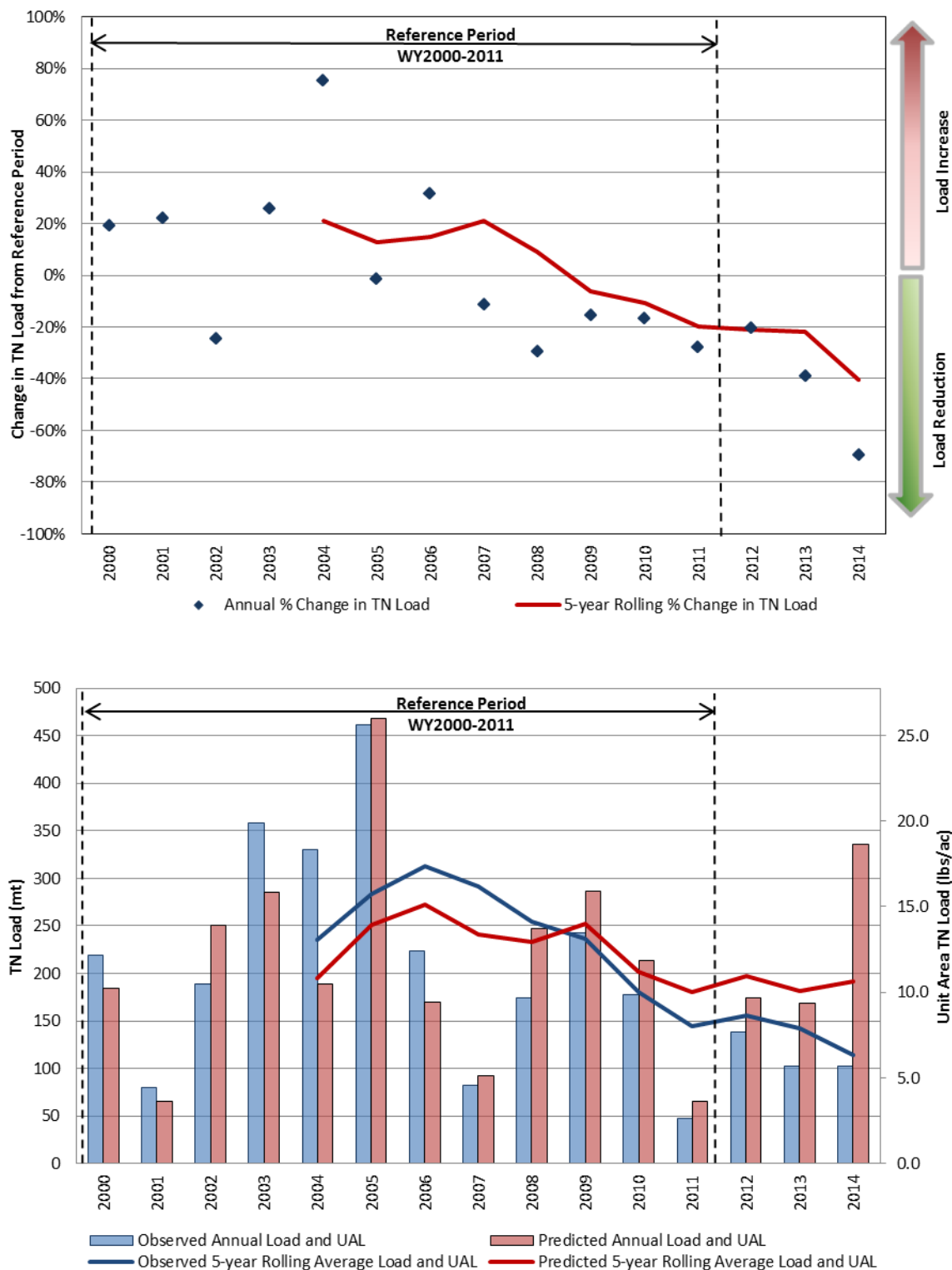


Figure 4-40. Ten Mile Creek Basin: Upper plot – annual percentage change in TN load from reference period and five-year rolling averages. Lower plot – observed and predicted (rainfall adjusted) annual TN load and UAL and five-year rolling averages.

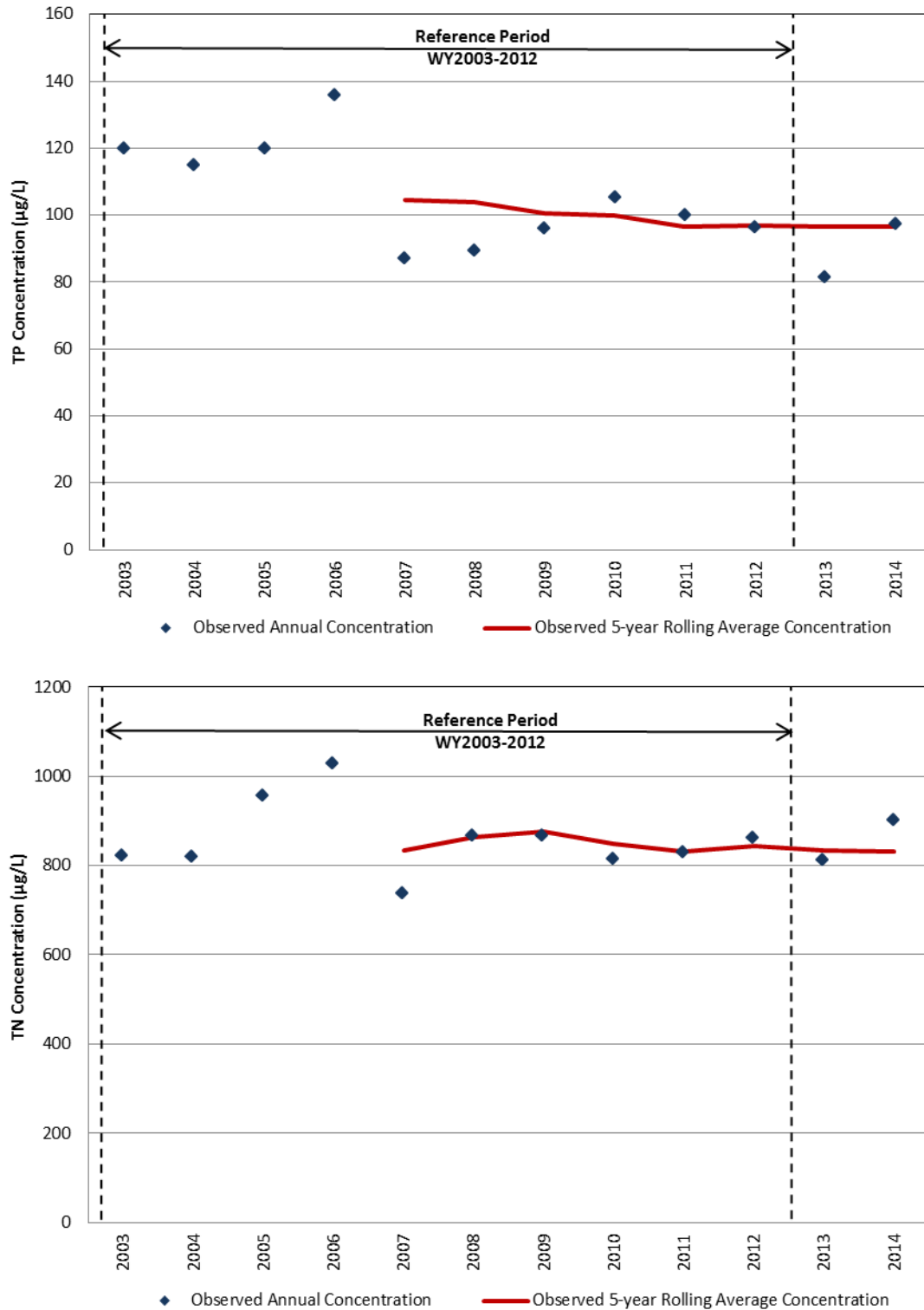


Figure 4-41. Composite Area – TP observed annual composite concentration and five-year rolling average. Lower plot – TN observed annual composite concentration and five-year rolling average.

SFWMD Anticipated Activities

BMP Regulatory Program

- The District Regulatory Program for the Lake Okeechobee, St Lucie River, and Caloosahatchee River watersheds is in a state of flux as the coordinating agencies develop water quality improvement strategies in the Northern Everglades. The District approach during this transition consists of tracking water quality trends, identifying areas of water quality concern, relying on the FDACS for implementing their voluntary agricultural BMP program, and addressing permit compliance, as needed, and will continue until adoption of amendments to Chapter 40E-61, F.A.C.
- Optimization of the monitoring networks at the basin-level monitoring sites and the upstream sites within the Lake Okeechobee Watershed, and St. Lucie River and Caloosahatchee River watersheds will continue as necessary to meet the requirements of Chapter 40E-61, F.A.C., and other program needs.
- For the Caloosahatchee River Watershed, the District will evaluate opportunities to leverage local government data collection efforts in the tidal and coastal sub-watersheds.

Rule Development

- It is a District priority to initiate the rule development process to amend Chapter 40E-61, F.A.C., to encompass the remaining Lake Okeechobee Watershed (Upper Kissimmee and Lake Istokpoga basins) and the St. Lucie River and Caloosahatchee River watersheds. It is anticipated that rulemaking workshops will be initiated to solicit public input on draft rule text so that an amended rule may be adopted and implemented in 2015.

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